

**Eco-Tourism and its Architecture:
A Methodological Framework for Assessing
Progress towards Sustainable Development**

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Glossary	
AT:	Alternative Tourism
B&B:	Bed and Breakfast
BBQ:	Barbecue
BC:	Bio Capacity
Bp:	Backpacker
C:	Capacity (number of bed spaces)
cap:	Capita
CBET:	Community Based Ecotourism of Thailand
CF:	Cultural Footprint
CODC:	Central Otago District Council
CPC:	Central Product Classification
CTD:	Community Tourism Development
DOC:	Department Of Conservation
eaNNp:	Environmental Adjusted Net National Income
ECF:	Economic Footprint
EF:	Ecological Footprint
EL:	Electricity
FCS:	The Framework for Cultural Statistics
GDP:	Gross Domestic Products
GDPs:	Sustainable Portion of GDP
gha:	Global Hectare
GJ:	Gigajoule
GNP:	Gross National Product
CSP:	Tidal and Concentrating Solar Power
GST:	Goods, Services Tax
HS:	Harmonized Commodity Description and Coding System
ICATUS:	International Classification of Activities for Time-use Statistics
ICH:	Intangible Cultural Heritage
IFACCA:	The International Federation of Arts Councils and Culture Agencies
Int:	Internet
ISCO:	International Standard Classification of Occupations
ISIC:	International Standard Industrial Classification
kWh:	Kilowatt Hour
MCMS:	The Ministry of Culture, Madrid, Spain
MJ:	Megajoule
NB:	New Building
NGO:	Non Governmental Organisation
NI:	North Island
NV:	Number of Visitors
NRC.U.S:	National Research Council (U.S.)
NZCTU:	New Zealand Council of Trade Unions
NZTS:	New Zealand Tourism Strategy
OCRT:	Otago Central Rail Trail
PV:	Solar photovoltaic panel
OECD:	Organisation for Economic Development and Co-operation
QCPA:	Quantity of Cultural Product
RB:	Refurbished Building
SC:	Self-Contained
SCT:	Sustainable Community Tourism
Sg:	Genuine Saving
SI:	South Island
SNZ:	Statistics New Zealand
So:	Solar Water Heating System
SPC:	Secretariat of the Pacific Community
TAT:	Tourism Authority of Thailand
TIES:	The International Ecotourism society
T-km:	Tourism-kilometre
UIS:	The United Nations Education Scientific and Cultural Organisation

UN:	United Nations
UNCSD:	United Nations Commission on Sustainable Development
UNDP:	United Nations Development Programme
UNEP:	United Nations Environment Programme
V/B:	Veranda/ Balcony
WCED:	World Commission on Environment and Development
WCOCAD:	The World Commission on Culture and Development
WWF:	World Wildlife Fund

Chapter 1: Abstract and Introduction

1.1. Thesis Abstract

This thesis proposes a composite framework for the evaluation of the environmental impact of tourism development on host destinations. In this study, the environmental impact of tourism is considered as a social-ecological phenomenon that can be categorized into the two aspects of natural and social-cultural impacts. Ecotourism is introduced as a type of sustainable tourism in that its policies and principles for development are based on conservation of environmental heritage (including natural and cultural heritage) via engagement of local people and communities in the tourism development process.

The proposed composite framework arises from the integration of an ecological and a cultural framework for the sustainable development of tourism. This framework places the conservation of natural resources as the main ecological outcome for eco-tourism. The proposed framework uses the ecological footprint (EF) of the main tourism activities and services (including transportation, food and accommodation services) as the ecological indicator for evaluation of ecotourism development to ensure it is ecologically compatible.

Ecological footprint (EF) is a way of measuring environmental impact. It assumes that everything needed for living, including all energy, goods and services can be obtained from land, and that any wastes produced can be absorbed by land (Wackernagel and Rees, 1996:9). Because land productivity varies considerably around the world the average global productivity is the normal measure, and this is called global hectares (gha). The ecological footprint of a product or activity produced/ consumed and conducted by a defined group of people can be measured through the following equation:

$$EF \text{ (gha)} = \text{Lifecycle energy use of a given group of people (product and activity produced or conducted) Gigajoules (GJ) / carrying capacity of the Earth (GJ/gha)}$$

The above equation determines the area required to produce resources and to absorb pollutants like carbon dioxide generated in the lifecycle energy use of the product or activity through using fossil fuels (coal, oil and natural gas).

Through using an ecological perspective, this thesis views culture as a system that links a group of people or a community to their surroundings through their use of local materials and energies, and the production and consumption of products from these. The proposed framework determines the main cultural outcomes for ecotourism development such as conservation of heritage and making the host people aware of their cultural values. In addition, it introduces related activities such as social events, conservation of heritage and producing and consuming local products as contributive activities for achieving the outcomes stated above. Furthermore it investigates and refines a number of indicators that can be used as tools for evaluation of the cultural footprint of the de-

velopment of ecotourism. Within these, local gross domestic product (GDP) as a social-economic indicator arising from tourism activities is also considered.

This thesis concludes by presenting a case study of 'The Otago Central Rail Trail' (OCRT) as an example of ecotourism. The OCRT was introduced in the New Zealand Tourism Strategy (NZTS) for 2015 as a successful model for community-based development of sustainable tourism. The investigation reviews the impacts of the OCRT on natural and cultural heritage by using the framework developed in the thesis and its related ecological and cultural indicators.

Through using the proposed holistic framework and the model for sustainable development of ecotourism, this thesis finds that, influenced by the development of the OCRT, many cultural heritage items including 60 bridges, 3 tunnels, and 78 buildings (used as OCRT accommodation services) have been refurbished. The restoration of this heritage can be considered as a policy that contributes to awareness of OCRT residents of their cultural heritage and identity. Likewise, as a part of the educational process related to ecotourism, this also makes an opportunity for OCRT visitors to learn about the cultural values of their host people.

As shown in Table 5.84, in 2011, the total EF of 11,788 OCRT visitors including the EFs of the four categories of transportation, food, accommodation and activities is 1,617 gha (0.138 gha /visitor). In comparison with the EF of 0.03 gha/ visitor for sustainable tourism (see Table 5.86), the overshoot portion of the EF of the OCRT is equivalent to $(0.138 - 0.03) 0.108$ gha/ visitor. Likewise the total overshoot EF of 11,788 OCRT visitors is $(11,788 \text{ visitors} \times 0.108 \text{ gha}) 1,273$ gha (see Table 5.86). This overshoot EF of the OCRT indicates that although the project has already been considered as a successful sustainable tourism project, still needs to reduce its total EF by 1,273 gha to be environmentally sustainable.

As determined in Chapter 5 (see Table 5.88), the overshoot portion of the OCRT is calculated as 127,310.4 GJ/year. Since the costs to generate 1 GJ of overshoot energy use through using renewable energy sources (in this case wind + solar) is NZ\$ 19.8, consequently the total cost to generate the overshoot energy use of the OCRT through using the latter systems (wind + solar) is equivalent to $(127,310.4 \text{ GJ} \times \text{NZ\$ } 19.8)$ NZ\$ 2,720,746.

Table 5.90 shows that in 2011, the total GDP of the OCRT is NZ\$ 6,245,289 This means the total cost that must be spent to generate the overshoot portion of the OCRT energy use in a sustainable way (NZ\$ 2,720,746) is 43.6% of its total GDP (NZ\$ 6,245,289). Consequently the sustainable portion of the GDP (GDPs) of the OCRT is $(\text{NZ\$ } 6,245,289 - \text{NZ\$ } 2,720,746)$ NZ\$ 3,524,543.

The results of this thesis demonstrate that using local products (e.g. home prepared foods) as a sustainable cultural behavior not only contributes to the ability of the host destinations located along the OCRT (such as Naseby and Cromwell, used as further case studies) to present their cultural products, but also contributes to reduce the environmental impacts and increase the economic outcomes of the OCRT. For example, producing 17% (13,346.4 kg) of the total of 65165.05 kg consumed food as home prepared food reduces by 5.5% the ecological footprint related to the food consumed by OCRT visitors. As determined in Chapters 5 and 6, in three case studies, producing

home prepared food contributes in a sustainable way to the increasing of the economic outcomes by about NZ\$3.5 / kg of food produced.

This thesis indicates that in all three case studies, using refurbished buildings as accommodation services, which is considered as an activity that contributes to preserving the cultural identity of the host destinations also contributes to reducing of environmental impacts and increasing the economic outcomes related to OCRT. For example in OCRT using 12.9% of bed space as refurbished buildings reduces by 14.5% (7.3gha) the total 50.5 gha ecological footprint of accommodation services compared with when all accommodation buildings are assumed as new buildings. Chapters 5 and 6 determine that in OCRT using 21,378 m² of refurbished buildings as accommodation services (12.9% of total bed spaces) increases by 5% the sustainable portion of GDP related to accommodation services. In Naseby also using refurbished buildings as accommodation services has the same sustainable ecological, cultural and economic outcomes as for the OCRT as a whole.

The framework indicates the use of open air areas as being a cultural-ecological indicator for evaluation of architecture as being sustainable. Through using the framework, it is determined that using open air areas including balconies and verandas as part of OCRT accommodation buildings exerts environmentally friendly influences on the host destination. For instance in OCRT using 387 square meters of veranda and balcony as part of the 80,356m² accommodation buildings decreases by 1.5% the total ecological footprint (50.5gha) of buildings used as accommodation services in OCRT.

The thesis results demonstrate that an architecture that will contribute to sustainable development through ecotourism has a cultural footprint area in which the architecture contributes to the host societies knowing and preserving their cultural identity, capitals and heritages. Simultaneously, it contributes to reducing the environmental impacts and increasing the economic outcomes of the host societies through ecotourism. This thesis determines that since all ecological, cultural and economic characteristics of sustainable architecture are linked together, a strategy to develop sustainable architecture is successful when it considers the linkage between all of these profiles and influences that they exert on each other.

1.2. Introduction

This thesis proposes a comprehensive framework and related indicators that can be used as tools to explore and evaluate the main environmental, cultural and economic characteristics of an architecture that contributes to sustainable development through ecotourism. The need for such a comprehensive framework arises from the experiences of the author who was involved with planning tourism projects in his home country between 1995 and 2007. This work revealed that the lack of a holistic strategy for tourism development meant the environmental, cultural and economic heritage and capitals of the host destinations were impacted by tourism. Likewise, one of the main goals of tourism

development and its architecture, the goal of human well-being, can be ignored due to the lack of a comprehensive approach to tourism and its development.

This thesis involves three main subjects: sustainability, ecotourism and architecture. Since sustainability is considered as an umbrella that covers all human activities and products, in this thesis sustainability and its policies and principles for sustainable development are considered as factors that make a link between ecotourism and its related architecture.

In addition, the holistic framework for sustainable development of ecotourism and architecture arises from the dominant policies and principles of sustainability. This study explores the current examples of the strategies (for example the New Zealand Strategy for the Sustainable Development of Tourism) and the proposed models for sustainable development of tourism, and determines the knowledge gap in this field that must be bridged for sustainable development of ecotourism and its related architecture. In Chapter 2, sustainability and its related policies and principles for development and strategies for the sustainable development of ecotourism and architecture are investigated. The literature review in Chapter 2 indicates lack of a comprehensive framework as the main knowledge gap for the sustainable development of ecotourism and architecture.

1.2.1. Sustainability

Sustainability is introduced as a multi-dimensional phenomenon that involves the three categories of: environment, society and economy. In sustainable development these three categories overlap to preserve environmental resources, promote and conserve socio-cultural capitals and heritage and develop the economic system in a way that responds to the needs of present and future generations.

Sustainable development is considered as a process in which all components of a given society are engaged in environmental, cultural and economic development through a social and educational process. Arising from this perspective the main anticipated outcomes for sustainable development are categorised into the three categories of: environmental, socio-cultural and economic outcomes.

The conservation of natural resources is viewed as the main environmental outcome for sustainable development that is considered a social-ecological phenomenon rather than

merely a technologically based process. Likewise achieving the environmental outcome for sustainable development is linked with other aspects of social and economic policies operated for development. In this thesis the main cultural outcomes for sustainable development are considered as awareness of local and indigenous people about their environmental and cultural capitals and heritage, and engagement of these culturally educated people in planning, management and monitoring of the sustainable development process. The main economic outcomes for sustainable development are introduced as equal distribution of natural, cultural and economic capitals among all components of a given society and engagement of them in a horizontal economic development.

In this thesis all of the mentioned above outcomes for sustainable development are linked together and contribute to each other during the course of operation.

1.2.2. Ecotourism

In this thesis ecotourism is considered as a sustainable part of mass tourism that follows the main principles of sustainable development. The main anticipated cultural outcome for the sustainable development of ecotourism is explained as awareness of people about their environmental and cultural capitals and heritage. Ecotourism is introduced as a set of purposeful nature based activities that has the ability to change the attitude of its host society to environmental, social and economic problems caused by development of capitalism. This can be viewed as influences exerted by ecotourism on its host destination towards being more sustainable. In this thesis these influences are defined as the cultural footprint of ecotourism and its products and activities on the host destination.

1.2.3. Architecture

Architecture is viewed as one of the ecotourism products that can contribute to sustainable development through ecotourism. In this thesis a given host destination or community is explained as an organism that has spiritual and physical interaction with its surrounding environment. In addition, architecture is explained as part of the social products that contribute to the interaction between society and its surrounding environment towards being sustainable through using spaces, materials and renewable source of energy in a sustainable way. The main cultural outcomes for architecture used as one of the ecotourism products are the same as the anticipated cultural outcomes for sustainable development of ecotourism. These outcomes include awareness of people about their cultural and environmental capitals and heritage and engagement of local people in

the sustainable development process through architecture used in ecotourism development.

1.2.4. Knowledge Gap

This thesis investigates the shortage of a comprehensive framework for assessing the sustainable development of ecotourism and its related architecture that can be used as a tool to determine the main ecological, cultural and economic characteristics of these two sustainable phenomena. On the other hand the shortage of a holistic strategy for ecotourism development and its architecture that has the ability to make a link between the main characteristics of both ecotourism and architecture as being sustainable is introduced as the main knowledge gap in these fields.

1.2.5. Key Research Question

Since the author of this thesis has already been involved with planning and development of rural and urban tourism and ecotourism in his home country, Iran, from 1988 to 2007, this has revealed how the negative impacts of uncontrolled tourism development and its modern products, such as architecture, can change the lifestyle of the host destination in a unsustainable way. It has also been determined that the top down approach to the planning, management and monitoring of a process like tourism development is not efficient when the major roles of local and indigenous people are ignored in whole process.

Moreover, it has been determined that the sustainable development of tourism and its architecture needs a holistic strategy beyond the economic and political goals arising from the development of capitalism. As some of the currently used modernised tourism products exert negative impacts on environmental resources, traditional lifestyle and cultural heritage of the host societies in Iran, the main key question has been formed as:

What are the main characteristics of an architecture that will contribute to sustainable development through ecotourism?

1.2.6. Comprehensive Framework

The comprehensive framework proposed for sustainable development of ecotourism and its products and activities is separated into the two sections:

1) a framework for ecotourism development

2) a framework for sustainable development of architecture (which here contains accommodation services) used in ecotourism development.

The comprehensive framework indicates the main environmental, cultural and economic outcomes for ecotourism and its architecture, and proposes the productive activities that can contribute to achieving these outcomes. The comprehensive framework is conceptualised in a holistic model that has the ability to make a link between the social behaviours of the host societies and visitors, their environmental impacts and economic footprint. On the other hand the holistic model proposed for sustainable development of ecotourism and its products (including architecture as a part of the used built up land) determines an area introduced as their cultural footprint area formed by the social-cultural behaviours of the ecotourism participants, and their ecological and economic footprints.

This thesis uses three case studies in Otago, New Zealand: the Otago Central Rail Trail (at regional scale), and the settlements of Naseby and Cromwell (at urban scale) that are considered host destinations for rural and urban New Zealand ecotourism (soft ecotourism). The proposed framework and holistic model for sustainable development of ecotourism and architecture will be tested in these three case studies to determine the linkage between ecological, cultural and economic characteristics of ecotourism and architecture in terms of sustainability.

In the 2009 provisional proposal for this thesis, Iran and New Zealand were proposed as the case studies for comparison of the sustainable development of tourism. The main reason for choosing these two countries was the differences between their environmental circumstances, cultural background, heritage and capitals, and economic systems. Both countries attended the 1992 Rio summit and approved Agenda 21 as their main policy for development. Consequently it was anticipated the outcomes for tourism development in both countries would follow a similar strategy. However, as the environmental, cultural and economic activities in the two countries are different, the productive activities contributing to achieving sustainable development of tourism could be different. For example, in New Zealand development of wineries could be seen as an activity that contributes to achieving conservation of cultural heritage and development of cultural capital, while in Iran, development of the Iranian rug (as a handcraft) or production of saffron (in north-east Iran) could play a similar role. Consequently the main

anticipated outcomes for both Iran and New Zealand could be same but the setting, priorities and productive activities to achieve the forecasted outcomes would be different.

Over a year after the research was started the Iranian government issued a statement that no overseas thesis could include an Iranian case study. There was a consequent urgent need to select a second case study. In addition to the original New Zealand OCRT case study, Naseby and Cromwell were selected as two locations within the OCRT for separate investigation, and together these formed the second case study. These two places were chosen because they have different cultural heritage, environmental circumstances and attractions for visitors (as explained in the thesis). The differences between Naseby and Cromwell in terms of these aspects allow the proposed framework for sustainable development of ecotourism and its related architecture to be tested against the OCRT as a whole.

1.2.7. Thesis Structure

This thesis contains seven Chapters comprising introduction (Chapter 1), literature review (Chapter 2), research methodology (Chapter 3), comprehensive framework (Chapter 4), first case study (Otago Central Rail Trail Chapter 5), second and third case studies (Naseby and Cromwell Chapter 6) and conclusion (Chapter 7).

The next Chapter investigates the three areas of sustainability ecotourism and architecture, the relationship between these areas, and the knowledge gap in terms of sustainable development of ecotourism and its architecture. The final section of Chapter 2 introduces the key research questions of this thesis which are integrated in its main key research question briefly explained in section 1.2.5.

Chapter 2: Literature Review

This chapter reviews literature on sustainability, ecotourism and architecture as the three main components considered in this thesis. The aim here is to identify: the relationship between these areas the factors that exert influence on this interaction, and uncover the knowledge gap in relevant policies and strategies for the development of ecotourism and its related architecture through sustainability. The discussion begins with a definition of sustainability, this is followed by explanation of its necessity, and its models, characteristics, goals, principles, framework and related indicators.

The literature review continues with a definition of ecotourism, introducing its environmental, social and economic effects on the host areas. It continues with an explanation of strategies for the sustainable development of tourism and its subsectors, such as ecotourism, by using the New Zealand Tourism Strategy 2015 (NZTS 2015) as an example. The next part of this literature review discusses sustainable architecture and its mutual relationship with environmental, societal and economic systems. Examples are given through use of the clustered villages of Nuristan in Afghanistan and the historic city of Kerman in Iran as examples of vernacular architectures and traditional urban fabrics. At the end, this literature review explains the main factors that make a link between ecotourism and its related architecture; it discusses the shortage of the writings that focus on ecotourism's architecture, and presents the key question of this thesis.

2.1. Sustainability

This thesis views sustainability as a key factor that plays an important role in defining ecotourism and architecture and in determining the main policies and strategies for their development. The reasons for this are discussed below.

2.1.1. Definition of Sustainability

Appleby (2011:7) argues that the roots of modern sustainability and related energy policy lie in the scenario proposed by the 18th century political economist Thomas Malthus, commonly known as the Malthus Catastrophe or Nightmare. In this scenario Mal-

thus forecasted that “population growth would outpace agricultural production” (Appleby, 2011:7). Since the onset of the industrial revolution in the latter parts of the 18th century and the subsequent development of capitalism, numerous catastrophic events have happened in the world (for instance famines and conflict in African countries such as Ethiopia and the Sudan) that suggest the truth of the ‘Malthus Catastrophe or Nightmare’ as people struggle for control of insufficient resources.

The World Commission on Environment and Development (WCED) has put forth the definition of sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their needs” (Kim and Rigdon, 1998:6). This concept of sustainable development, which was established in the Brundtland Report (WCED, 1987), attempts to support continuous development of human societies for the present and future generations. “The concept also emphasizes balance of growth in social, economic and environmental aspects which are regarded as the key attributes that support the development of a sustainable society.” (Robin and Poon, 2009:3616). However, this very definition raises questions, as ‘growth’ in environmental aspects within a finite system like planet earth is itself not a sustainable activity.

As the Board on Sustainable Development of the U.S. National Academy of Science identifies, through sustainable development “what is to be sustained fall into three major areas of nature, life support system and community” (NRC.U.S, 1999:23). They also identify intermediate categories for each such as earth, environment and cultures. Likewise, “what is to be developed [through sustainable development], also fall within three major areas of people, economy and society” (NRC.U.S, 1999:25).

2.1.2. The Necessity for Sustainability

Nowadays, humans are faced with different issues like uncontrolled growth of population, dramatically expanding urban areas and, consequently, increasing needs to use more energy resources, as well as degradation of the environmental heritage and unequal distribution of capital.

Due to the industrialisation and the expansion of modernisation, urban areas throughout the world have increased in size and population. According to Omer (2008:2272), about 50% of the world’s population are urban dwellers. In addition, he (2008:2272) reveals

that all population growth expected between 2000 and 2030 will be concentrated in urban areas because of the rural-to-urban shift of populations. Furthermore, with an expected annual growth of 1.8%, the world's urban population will double in 38 years. In terms of resource consumption, at present 2% of the land surfaces in the world are covered by cities, yet the people living in them consume 75% of the resources consumed by humankind. Omer (2008: 2272) points out that the ecological footprint of cities is many times larger than the areas they physically occupy. Continued growth of the world's population has caused serious need to use all sources of energy, particularly fossil fuels like oil and gas. As many researchers such as Appleby (2011:7) point out if everyone in the world lived like the average North American “we would need a planet five time bigger than the earth to live on” (Appleby, 2011:7). This is obviously an unsustainable situation.

2.1.3. Models of Sustainability

Vale and Vale (2009:10) discuss the two models for portraying the meaning of sustainability; the ‘weak model’ and the ‘strong model’ of sustainability. According to Vale and Vale (2009:10) in the weak model of sustainability, the three main components of sustainable development, the environment, human society and the economy are represented by three intersecting circles of equal size and values (Figure 2.1).

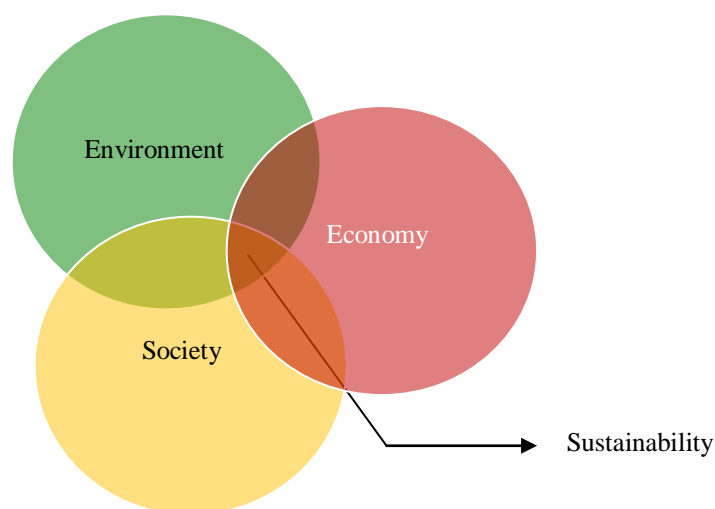


Figure2.1: Weak model of sustainability

In the weak model of sustainability, the three main components are portrayed as competing interests so that degradation of one can be compensated for by improvement in

another. In the strong sustainability model, as explained by Vale and Vale (2009:10) the environment is considered as a circle in which society (as a base for human activities) is set (Figure 2.2). In this model, the environment is considered as the main foundation, which strongly exerts influences on society, culture and all their subsectors such as the economy, architecture, politics, art etc. (Figure2.2).

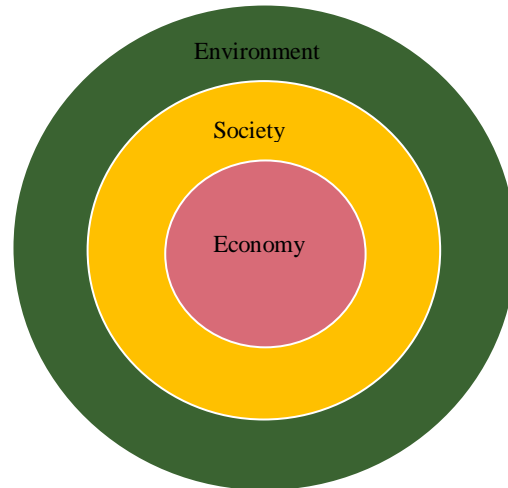


Figure 2.2: Strong model of sustainability

As a reason to make an effort to move towards environmental conservation through sustainable development as a priority policy, it could be conjectured that “if we destroy the environment, which sustains us and provides our air, water and food, then we will destroy human society; if we destroy human society; we will certainly destroy the economy” (Vale and Vale, 2009:11).

Although the main anticipated outcome for sustainable development is environmental conservation, its process must be started from economic development in a sustainable way which is conducted by educated societies. Natural capital, physical or produced capital, human capital and social capital are four factors that determine sustainable development. “Sustainability or the capability of future generations to meet their needs is ensured when the total stock of these assets remains constant or is increased in the production process” (Veron, 2001:602). As Graff et al (1995:205) reveal, in sustainable development, economic, cultural and social developments are interrelated. They (1995:205) argue that in sustainable development environmental problems cannot be isolated from others such as poverty and social disintegration. Likewise, economic growth makes poverty alleviation easier and cultural development can change the pat-

tern of the consumption of natural resources in order to ensure their protection. Furthermore, social education and development can also exert influences on economic growth in an economically sustainable way. For example, decentralisation and democratization in developed societies may lead local economic systems toward more equal distribution of capital among the local participants.

Environmental sustainability exerts positive impacts on development of human capital because all humans are part of nature. Thus, the environment plays an important role in ensuring human survival, health, social life, sustainable energy production, food production and access to clean drinking water and clean air. Generally, sustainability is viewed as a phenomenon that is a common area between environmental conservation, cultural restoration and promotion and socio-environmental economic adaptation. Using a social perspective, sustainability can be viewed as a way in which an educated group of people or societies can choose to live in an effort to conserve their environmental and cultural heritage and capitals and develop their economic system. It strives to present a comprehensive strategy which covers all human activities and products and adapt them with sustainable patterns of consuming the natural and cultural resources in the development process.

2.1.4. Fundamental Characteristics of Sustainability

Culture, environment and economy, as categories that are subject to conservation and development in the sustainability process, can be changed in terms of their relative positions depending on different places and times. Consequently, sustainability is an inherently dynamic, indefinite and contested concept. “Sustainable development must, therefore, be seen as an unending process-defined not by fixed goals or the specific means of achieving them, but by an approach to creating change through continuous learning and adaptation” (Mog, 2004: 2139). Therefore, flexibility and adaptability in terms of different cultural, environmental and economic situations are the main factors, which can be used as frameworks to evaluate sustainability. A sustainable development project will be successful if its products (including cultural, natural and economic outputs) are culturally appropriate, economically viable and environmentally sensitive.

To achieve sustainable development, indigenous people and their needs, natural resources and the development of conservation policies to protect them, and local eco-

conomic systems and their shift toward sustainability must all be viewed as the main components of progressive strategies. If a development project ignores some of these components during its programming, management and implementation, it cannot be called a sustainable project. For example, Mog (2004: 2143) argues that a project that reduces land degradation but at the same time increases poverty or inequality, or achieves its goals through the establishment of rigid institutions (e.g. forcing all farmers off a parcel of land and establishing a strictly exclusionary protected area) would not be considered successful in promoting sustainable development, no matter how great the improvement in environmental quality. On the other hand a project which enhances environmental quality in a culturally sensitive manner (e.g. through extension of appropriate conservation farming techniques) without having any positive impact on poverty, is also grossly insufficient. As a result, projects which create significant positive change in many realms while generating little or no negative impacts can be viewed as sustainable activities.

2.1.5. Sustainable Development - Goals

One of the main aims for sustainable development is to reduce the use of non-renewable energy resources. The World Summit on Sustainable Development in Johannesburg in 2002 committed itself to supporting and encouraging the expansion of renewable energy resources to accelerate the shift towards sustainable consumption and production. It could be argued that the main goal for the latter summit was to make productivity independent from resource use. According to Omer (2008: 2270), breaking the linkage between resource use and productivity can be achieved by trying to ensure economic growth does not cause environmental pollution. He (2008: 2270) argues that the main policies for achieving the goal of a pristine environment are; improving resource efficiency, examining the whole life cycle of the product, enabling consumers to receive more information on products and services, and examining taxes, voluntary agreements, subsidies, regulation and information campaigns regarding the best stimulation to innovation. However, this approach still fails to recognise the fundamental problem that there must be a limit to growth within a finite system.

2.1.6. Sustainability- Principles

One of the basic strategies to achieve the goals associated with sustainability is to make societies aware of the components and structure of sustainability, its policies and bene-

fits. In 1991, the World Conservation Strategy (cited in Robin and Poon, 2009:3616) stated the principles of a sustainable society include; respect and care for the community; improvement in the quality of human life; conserving the earth's vitality and diversity; minimising the depletion of non-renewable resources; keeping within the earth's carrying capacity; changing attitudes and practices; enabling communities to care for their own environments; providing a national framework for integrating development and conservation; and creating a global alliance. According to the latter principles, change of attitudes and practices can be viewed as a focal point for cultural shift toward sustainability. Robin and Poon (2009:3616) point out that change of attitudes and practices means a transformation of mind-set and actions. These criteria demand changes in the innate basic assumptions, values, beliefs and behaviour that are present in the established culture of society.

2.1.7. Sustainability Frameworks and Indicators

Sustainable development is viewed as a multi-complex phenomenon that rests on three pillars: "economic growth, social progress and protection of the environment and natural resources" (Hueting and Reijnders, 2004:250). Such a complex phenomenon cannot be evaluated without the existence of a comprehensive framework that covers all the components mentioned above. Although different frameworks and indicators like "ecological footprint" (Wackernagel and Rees, 1996) and "Genuine Saving (Sg)" (Pearce et al, 2001) in terms of sustainable development have already been suggested, most of them do not cover all levels of production (global, national or local), environmental conservation or social development. To explain more about indicators, their strengths and weaknesses, some examples are given below.

2.1.7.1. Ecological Footprint

One of the alternative measurement mechanisms which emphasises environmental conservation is the ecological footprint. "The ecological footprint is an accounting tool that estimates the resource consumption and waste assimilation requirements of a given population or economy in terms of corresponding area" (Ness et al, 2007: 502). According to Ness et al (2007:502), ecological footprint is a multi-stage process which attempts to estimate the average person's annual consumption of food, housing, transport, consumer goods and services in terms of the productive land needed to generate it. Munda (2006:87) views the ecological footprint index as an indicator related to the idea

of urban carrying capacity. In this view, ecological footprint solves some of the problems of traditional carrying capacity simply by inverting the usual carrying capacity proportions. Munda (2006:87) argues that ecological footprint computes the land area required per person (or population) instead of presenting population per unit area.

The main core of the ecological footprint index is that every category of energy, material consumption and waste discharged needs the productive or absorptive capacity of a finite area of land or water. In fact, in terms of ecological footprint, if the land requirements for all categories of consumption and waste discharge by a defined population are summed up, the total area represents that population's ecological footprint. Of course, this area can cover a region many times larger than the home region of the same population. According to Munda (2006:87), the ecological footprint of a specified population or economy is the area that would be required for providing all the energy and material resources consumed, and absorbing all the waste discharged by a given population in a given area.

a. Strengths and weaknesses of the Ecological Footprint

The Ecological Footprint (EF) index is an efficient way of showing the balance between the quantity of products and environmental carrying capacity in a given area. In some cases it will show how the ecological footprint of a given population can exceed the political frontiers of a country. It means, in the latter cases, economic development, conservation of natural resources and social promotion in a given area and population depend on other countries, with their different economic systems, socio-cultural structures and conservation policies.

Ecological Footprint can also look at components of a lifestyle. Looking at the land used to produce, say, the current diet could cause intensive development of agriculture production systems in an effort to lower the EF. Munda (2006:88) states that intensive agricultural systems can reduce the horizontal expansion of a city but at the same time will significantly increase energy consumption (in terms of intensive agricultural development) and degradation of biodiversity, due to the use of fertilisers and pesticides and the introduction of exotic species. Calculating the EF will reduce all these effects to a single number for comparison with other food producing strategies.

Table 2.1 sets out the advantages and disadvantages of ecological footprints (EF) as determined by Mayer (2008:286) and Walsh et al (2006:4). As demonstrated in Table 2.1, the EF is a single unit ecological indicator that can be applied to different human activities and products, from food to transportation, to water consumption, to recreational activities and built up land. Since the EF has the ability for continual updating, it can be viewed as an efficient indicator for monitoring and managing the process of development. The EF can be used to raise alarm about the shortcomings of policies related to the conservation of finite natural capitals. It can also be used to make people aware of environmental problems. As shown in this thesis, the EF has the ability to be combined with other social and economic indicators, such as GDP. Its combination with such social economic indicators results in environmentally sensitive economic indicators such as ‘Sustainable Portion of GDP’ (GDPs) (See Chapter 4- section 4.1.3.3).

Table 2.1 shows the accuracy and clarity of the EF and its results can also be viewed as its dominant weaknesses. Since the measurement of the EF of a product and activity relies on using related data, most of the shortcomings of the EF arise from the deficiency of the information systems used for producing, managing, collecting and analysing data at regional, national and global scales. On the other hand these weaknesses cannot be considered as innate, but rather explained as weaknesses exerted on the EF by the deficiencies of other factors, such current information systems.

Table 2.1: Advantages and disadvantages of the ecological footprint

Advantage of EF	Disadvantage of EF
Single unit indicator that allows disaggregation.	Mostly hypothetical land uses
Widely applicable to activities	Can oversimplify resource use
Top down or bottom up	Detailed studies incur uncertainty, particularly at sub-national level.
Useful communication tool	Double counting is always a risk.
Continually being updated and improved	Mostly snapshots of consumption.
Demonstrates the finite nature of natural capitals	Provides no clear policy guidance except to consume less or create additional productive land.
Growing credibility as a policy tool	Based on sometimes doubtful assumptions
Measurability and comparability for systems of any scale, from bio fuel production systems to urban areas, to nations and the human species.	Can be difficult to reconcile annual consumption with the necessarily much slower provision of bio-capacity.
Addressing intergenerational equity and international fairness.	May not be a completely accurate representation of strong sustainability given some methodological shortcomings.
Can be used to monitor a system over time if the index is calculated repeatedly with new data.	
Reference: Mayer (2008:286) and Walsh et al (2006:4).	

2.1.7.2. GDP and its Possible Adjustments

a. GDP

GDP is a very common macroeconomic indicator, having been used in the United States since 1963 (Bagstad and Shammin, 2012:313). It is a measure of the monetary value of the annual production of goods and services in a domestic location, so covers the natural and human created capital in a particular place, such as a nation. It can be calculated in nominal or real values (Lawn, 2003:106). Lawn further argues that if GDP is measured in nominal values, it is measured in terms of the prices at the time of production and if in real values, in terms of the prices of all goods in a particular year, which is often referred to as the base year. Consequently, differences in the quantity of goods and services produced from year to year can be reflected by annual changes in real GDP.

In 1992, the United Nations Conference on Environment and Development in Rio de Janeiro underlined the limitations of gross domestic product (GDP) as a measure of sustainable development for a country. Agenda21 (1992: paragraph 40.4) found GDP to be an example of common indicators that do not assess the sustainability of an economic system. Rennings and Wiggering (1997:26) suggest that measuring the economic and environmental aspects of sustainable development need to be complementary, while Barrass et al (1997:101) go further by stating that growth in GDP will only align with sustainable development if the environment and the resources it supplies are valued in the same way. The same authors go on to say that conventional ways of assessing GDP tend to undervalue the vital natural resources supplied by the environment, since no account is taken of their replacement times.

Bagstad and Shammin (2012:331) identify five common criticisms of GDP: (1) it consists of simple addition of all expenditure, even expenditure that does not improve social welfare, such as that spent on defence; (2) it excludes the value of unpaid household labour and volunteer work in the community; (3) it fails to account for the value of non-renewable resource depletion while total resource stocks decline over time; (4) it fails to account for income distribution, poverty, and the costs of inequality; (5) it lacks inclusion of the positive contributions from natural, human and social capital types.

b. Adjustments to GDP

Given the shortcomings of GDP, economists have proposed adjustments to it to make it a better measure of social wellbeing. One of the notable works is Daly and Cobb's (1989) index of Sustainable Economic Welfare (ISEW) which was later revised as the Genuine Progress Indicator (GPI). ISEW/ GPI is a composite indicator which includes economic, social and environmental indicators. Examples of the former are "Personal consumption per capita" and "Value of household labour", social indicators include "Cost of crime" and "Loss of leisure time" and environmental indicators are based on measurables such as "Cost of air pollution" and "Loss of forest cover" (Bagstad and Shammin, 2012:331). GPI calculation includes the cost of environmental degradation as well as factors for natural capital regeneration but is still arbitrary in what is included and excluded (Pulselli et al, 2006:273).

In addition Pulselli et al argue that since ISEW/GPI is composed of a list of items which indicate economic welfare or sustainability, ISEW/ GPI cannot be used as an indicator of the real level of economic welfare at the same time as being an indicator of sustainability. As explained by Pulselli et al (2006:273) ISEW/GPI does not really achieve its anticipated outcomes as it was based on the strong sustainability model within which it is not possible to substitute human capital for natural capital. Furthermore the authors go on to say they believe ISEW/GPI does not make a clear distinction between natural and natural capitals or between the two forms of natural resources (non-renewable and renewable). Nourry (2008:447) also points out that in ISEW/GPI, the incorporation of the cost of environmental degradation is not sufficient to determine sustainability or otherwise, so it cannot be strictly considered as an indicator of sustainable economic welfare.

2.1.7.3. Sustainability Assessment

Ness et al (2007:500) have suggested another sustainability assessment tool that consists of three umbrellas or general categorisation areas (Figure 2.3). These areas are indicators and indices, which are further broken down into non-integrated and integrated product-related assessment tools. In the non-integrated assessment the focus is on the material and/or energy flows of a product or service from a life cycle perspective, while the integrated assessment is a collection of tools usually focused on policy change or project implementation.

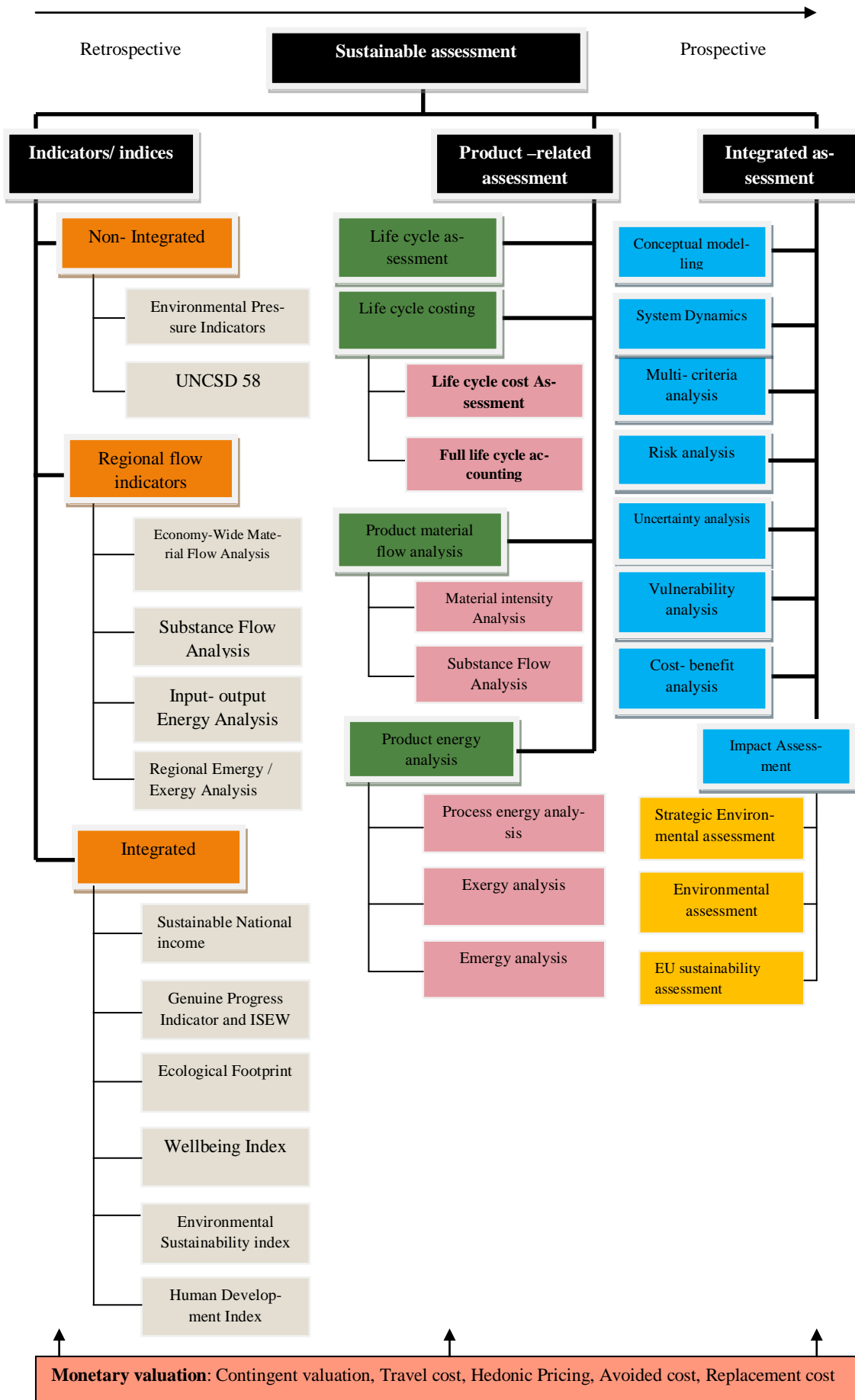


Figure 2.3: Framework for sustainability assessment tools (Ness et al, 2007:500)

There is also the overarching category at the bottom of the figure used when market values are needed in the three categories. In Figure 2.3, the proposed assessment tool framework is based on the temporal focus of the tool along with its objective focus. The arrow at the top of the framework shows the temporal focus, which is either retrospective (indicators/indices), prospective (integrated assessment) or both (product-related assessment).

The objective focus of the tools is either spatial, referring to a proposed change in policy (indicators/indices and integrated assessment), or at the product level (product-related assessment). The monetary valuation tools on the bottom are used when monetary valuations are needed in the above tools. “Thick lines around the boxes mean that these tools are capable of integrating nature–society systems into a single evaluation” (Ness et al, 2007:500).

2.1.7.4. Genuine Saving (Sg)

Genuine saving (Sg) is a proposed economic indicator for sustainability which is defined by Pearce et al (2001), (cited in Hueting and Reijnders, 2004:258). The term is a version of environmentally adjusted net national income (eaNNP) which includes adjustment for damages, compensation and depletion. The general equation is given below.

$$eaNNP = C + Sg$$

This is analogous to gross savings ‘S’ in the definition equation of gross national product ($GNP = C + S$) and also analogous to net savings $S_n (= S - dK)$ in net national product ($NNP = C + S_n$). In these expressions, C=consumption, S=gross saving and dK =depreciation of produced assets. Consequently, $Sg = S - dK - r(R - G) - p(E - A)$, where r =unit resource rent (defined as the difference between the price obtained for a unit of extracted or harvested resource and its marginal costs of extraction or harvesting); R =resource extraction or harvest; G =natural growth rate of the resource (zero for non-renewable); p =marginal social damages from pollution; E =emissions; A =natural assimilation (i.e., dissipation) of pollutants; and $r(R - G)$ and $p(E - A)$ are the values for depreciation of natural resources and the value of net pollution damage, respectively.

Hueting and Reijnders (2004:258) argue that welfare depends on total stocks of produced, natural and human assets. Moreover, they argue that the combination of labour (technology) and elements from physical surroundings (the environment) give produced capital. Consequently this system is dependent on only two factors, human beings and the environment. As a result, a production level that guarantees conservation of vital environmental functions with available technology is an unavoidable policy for environmentally sustainable development.

Hueting and Reijnders (2004:258) have suggested some conditions for the calculation of the Sg indicator and for versions of the related eaNNp. Some examples of these conditions are summarised here. First, any increase in human assets must be used exclusively for environmental protection and/or for growth of production that does not (further) damage the environment. Secondly, likewise increases in stocks of produced assets must be exclusively for the purpose of environmental protection or 'clean' growth. Thirdly, resource revenues must be invested in environmental protection or 'clean' growth. These conditions are hard to satisfy because, for instance in relation to the first and second conditions, "expenditures on environmental protection check production growth" (Hueting and Reijnders, 2004:258) and "it is precisely the most environmentally damaging sectors of the economy that account for the bulk of production growth" (Hueting and Reijnders, 2004:258).

A sustainable development framework should be viewed as a multi-dimensional umbrella in which all sectors are represented by efficient indicators for evaluating economic, social and environmental development. If there are any conditions attached to using these indicators, these conditions must be practical in terms of using the available technologies and should not neglect the fact that sustainability is based on multi-directional development. Thus, a multi-dimensional framework is of paramount importance for a correct indicator framework for sustainability.

2.2. Ecotourism

2.2.1. Definition of Ecotourism

Like sustainability, ecotourism is a concept that seems easy to recognise as a broad idea but is difficult to define in detail.

2.2.1.1. General Views of a Definition Ecotourism

At present there is no consensus on the definition of the term ecotourism, and its identification and usage remain associated with a great deal of confusion and disagreement. Buckley (2009:2) states that the earliest known use of the term 'eco-tour', undefined, seems to have been by Parks Canada in the 1960s. Wearing (2008:6) states that ecotourism is recognised as one of the segments of the tourism industry which is growing three times faster than other parts. This definition only puts stress on the speed of growth as a main difference between ecotourism and the other main sector of mass-tourism. Because of this, this definition cannot clarify and cover all the different dimensions of ecotourism such as its relationship with the economic system, environment and people.

According to Blangy and Mehta (2006:233), the International Ecotourism Society (TIES) views ecotourism as responsible travel to natural destinations which protects the environmental resources and develops the well-being of the indigenous people. This definition is complex as it brings together the idea of both 'untouched' landscape and an 'untouched' people within it, recognising that both may be changed by ecotourism.

In 1980, Ceballos Lascurain (cited in Weaver, 2009:3) introduced ecotourism as tourism that involves travelling to relatively undisturbed or uncontaminated areas with the specific objective of studying, admiring, and enjoying the scenery and its wild plants and animals, as well as any existing cultural manifestations (both past and present) found in these areas. This definition only deals with a pristine landscape, ignoring to a large extent those who live in it. In addition, areas which have already been developed for other purposes are omitted from ecotourism development in this definition.

2.2.1.2. Location and Definition of Ecotourism

The location where ecotourism occurs is one of the factors which give rise to different opinions about its definition. For instance, in contrast with Lascurain whose definition emphasizes undisturbed or uncontaminated areas as locations where ecotourism can happen, Weaver (1999:795) argues that while such environments (for example protected areas like national parks) for obvious reasons clearly constitute a desirable context for appreciation of natural attractions, there is no a priori basis for excluding modified landscapes attractive to certain types of wildlife, such as reservoirs, managed forests, communal or private lands adjacent to parks, and some types of agriculture lands as ecotour-

ism destinations. According to this view, even the remaining “changed” land and water areas have the ability to accommodate demand for ecotourism and other recreational pursuits. Furthermore, once a pristine landscape becomes an eco-tourist destination it is no longer pristine, and must be changed. This suggests that ecotourism cannot just rely on undisturbed landscape.

2.2.1.3. Sustainability and Definition of Ecotourism

Sustainability is the essential characteristic of ecotourism which basically becomes its main difference with regard to other segments of the tourism industry. More recent definitions have proclaimed some particularity for ecotourism such that it “must be economically viable, ecologically sensitive, and culturally appropriate” (Wall, 1997, p.483). According to this definition, if ecotourism and its development cause negative impacts on the environmental resources, visitors, host communities and their economic systems, it cannot be defined as “ecotourism”.

Perhaps the most restrictive definition is given by Butler (cited in Weaver,1999:794) who insists that ecotourism must simultaneously satisfy eight descriptive criteria, including consistency with a positive environmental ethos, biocentrism, enhancement of the resource base, attainment of educational benefits, and conveyance of high informational and emotional dimensions. Although Butler has introduced these rigorous parameters to clarify the definition of ecotourism, it is clear that, among all segments of mass-tourism, very few activities would qualify as “ecotourism” within his criteria.

Against this idea that sustainability is an umbrella that covers all ecotourism products and policies, several qualifications have been suggested as the basis for introducing a liberal ecotourism model. For example, Weaver (1999:794) argues that any insistence that ecotourism must not negatively affect the environment or host society is unrealistic, since it is impossible to ensure, categorically, that a particular visit or resort will not result in any significant long-term negative consequences. An emphasis on sustainability in intention is thus more realistic than an insistence on sustainability in outcome. But, in contrast to this view, Khan (2003:111) considers ecotourism as purposeful time spent in an environment in a sustainable way that attempts to learn other culture and help economically its host communities that work toward conservation of ecosystems.

2.2.1.4. Definition of Ecotourism as a Segment of Alternative Tourism

Ecotourism has come to be closely associated, and is even sometimes synonymous, with equally controversial and much debated terms such as sustainable tourism and alternative tourism. Buckley (2009:18) defines ecotourism as a part of a much broader tourism product sector, which includes nature, wild life, adventure, cultural and perhaps also farm or rural tourism. Ecotourism is viewed by Weaver (1999:797) as a segment of alternative tourism. Weaver (1999:797) also argues that alternative tourism (AT) is commonly defined, at least in its ideal configuration, as a locally controlled sector adhering to vernacular architectural norms and attracting a more allo-centric or community minded type of client. Figure 2.4 depicts an interpretation of the popularly perceived relationships among the various types of tourism.

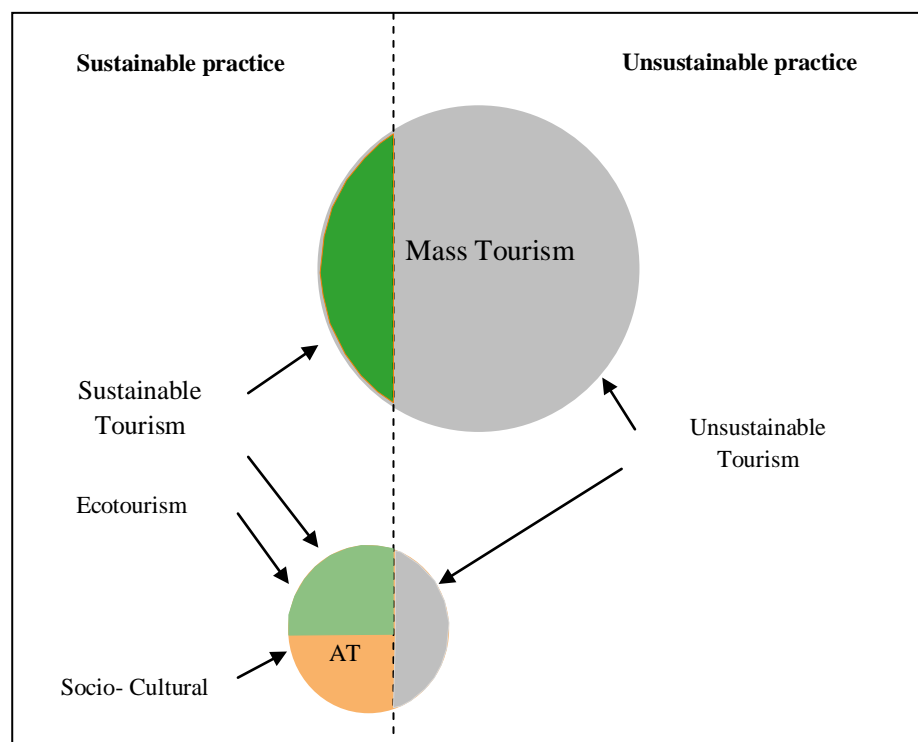


Figure 2.4: Perceived relationship between sustainability, mass tourism, alternative tourism (AT), and ecotourism

According to Weaver (1999:798), internally alternative tourism may be separated into nature oriented and socio-cultural components, depending on whether the stress is on natural or “authentic” cultural attractions. However, since the above perspective of ecotourism requires coherence with sustainability, then only those instances of nature-based AT that are situated on the sustainable side of Figure 2.4 can be classified as ecotourism.

In contrast to the latter classification, according to several recent definitions (Blangy and Mehta, 2006:233; Wall, 1997, p.483; and Weaver and Lawton, 2007:170), ecotourism must be viewed overall as a sustainable activity which directly attempts to protect and develop both environmental potential and socio-cultural structure in the host areas. Consequently, ecotourism is similar to sustainable AT and has an ability to cover other sustainable segments of mass tourism.

2.2.2. Ecotourism and Environmental Heritage

The relationship between tourism and the environment and the environmental implication of the development of tourism can be polarized into both negative and positive aspects. For example, on one side, “conservationists see both [tourism] developments and tourists themselves as threats to survival of wildlife and of treasured natural resources” (Coppock, 1982:270). Pigram (1980:559) points out that even some researchers such as Cohen (1978), who conceded the existence of some beneficial effects from tourism, particularly in the economic, political and cultural spheres, appear convinced that, “in the long run, tourism like any other industry, contributes to environmental destruction” (Cohen 1978: 220).

On the other side, researchers such as Weaver and Lawton (1999:16) believe that alternative tourism as one part of mass tourism can be considered to be the legitimate form of tourism, and the only one that could be considered sustainable. They (1999:16) argue that special mention should be made of ecotourism, which is widely defined as a variant of alternative tourism that puts primary emphasis on the natural environment to be used and protected as the basis for product attraction. In addition, ecotourism “posits that the basis of interaction with the natural environment is one of inherent appreciation and/ or educational interests, and not merely as a suitable setting for a hedonistic or thrill seeking experience (as in sunbathing and white-water rafting, respectively)” (Weaver and Lawton, 1999:16).

There is no debate over the fact that uncontrolled development of tourism can exert negative influences on natural conservation. Coppock (1982:272) categorizes these impacts into five categories comprising loss of habitat; damage caused by the pressure of human feet or vehicles on soil and vegetation; damage to flora and fauna by fire; damage to, or destruction of, flora and fauna by pollution; and disturbance of fauna, espe-

cially birds and mammals. In addition, some other negative impacts such as increasing the ecological footprint of the host destination as influenced by food consumed, transportation used, an increase in built up land, water consumed and the sewage generated resulting from tourism can be added to these other categories.

May (1991:113), in a general view, separates the impacts of tourism into two types, these being those which are associated with structures (hotels, roads, aircraft etc.) and those resulting from tourists themselves. Likewise, Coppock (1982:272) reveals that the impacts of tourism on nature conservation are the products of conscious actions taken by developers, promoters, planners or visitors and that some are the unintended and often unconscious by-products of tourism.

Many researchers, such as Ferrell and Runyan (1991:26) and Marcouiller et al (2004:1034), view the natural environment as a crucial potential for the attractiveness of almost all travel destinations and recreation areas. May (1991:114) reveals that much tourism occurs in locations which are particularly sensitive to change, e.g. rivers, forests and lakes. According to Ferrell and Runyan (1991:30) it is characteristics of most natural features that they are physically altered by use. They (1991:30) suggest that positive change should be the goal and negative change, which even in small amounts can be critically damaging, should be omitted or reduced.

To clarify the relationship between ecotourism and environmental conservation, Buckley (2009:149) views minimizing impacts on the natural environment as a key criterion for its evaluation. On the other hand, one of the main goals for developing sustainable ecotourism is to protect ecosystems which provide the services essential for human activity. In terms of ecotourism, an ecosystem “in short can be described as supporting life, supplying materials and energy, and absorbing waste products” (Gössling, 1999:303).

Although it is clear that human life seriously depends on conservation of natural resources, currently, particularly in developing and industrialized countries, natural resources are decreasing dramatically as the result of human activities. For example, according to Gössling (1999:310), tropical rainforests, which contain more than half of all species in the entire world and provide a range of essential services, are the biome in

greatest danger, declining by rather more than 150,000 km² per year. Moreover, current protective policies and programmes cannot cover all valuable natural resources.

Gössling (1999:310) states that in 1993, less than 5% of tropical forests is protected within parks and reserves. Furthermore, exploitation of environmental heritage, consumerism, and extremely high per capita demand for resources also support the loss of biodiversity. Gössling (1999:304) further argues that the latter problems are caused by tourist activities, like air travel which consumes fossil fuels and leads to significant emissions, a lack of successful economic systems, and weaknesses of the present policies to value nature and its profits. Indeed, the root cause of the exploitation of natural resources is substantially a multi-dimensional problem and needs a comprehensive solution.

Sustainable ecotourism as a multi-dimensional phenomenon could be viewed as a means of mitigating the socio-economic situation at both local and international scale, and supporting environmental conservation. Development of ecotourism and other segments of mass-tourism, without effective policies to manage and monitor the process of development, causes issues such as loss of biodiversity, and expansion of poverty in the adjacent and other areas which are not covered by development programmes. To explore and introduce some of the latter issues, it is useful to look at the example of Costa Rica, a country which is widely cited as a popular ecotourism destination.

2.2.2.1. Case Study of Costa Rica

Costa Rica is a small country which has 51,100 km² of land surface, being only 0.03% of the earth's surface. It is an ideal reference point for tropical ecology in the world. Costa Rica has abundant majestic wet and dry forests, impenetrable coastal and inland wetlands, wild rivers, productive estuaries, fog and rain-shrouded mountains, and active volcanic landscapes that support some of the most impressive and dense biodiversity found on the planet. "Costa Rica ranks about 20th among nations of the world in terms of its biodiversity. Costa Rica has 28.2 species of terrestrial vertebrates per 1000 km². By contrast, Ecuador, which has the richest biodiversity in the world in absolute species number, has only 9.2 species of vertebrates per 1000 km²" (Kohlmann et al, 2008:255). Because of its fortuitous tropical setting, Costa Rica has also served as an important lo-

cation for agricultural production, including crops such as coffee, bananas, pineapples, wood and wood products.

In terms of its protected areas, nearly 23% of Costa Rica's land area is under some sort of public park system. In 2007, the Costa Rican Tourism Institute reported that "because of its incredible ecological systems, Costa Rica has also attracted more ecotourists and adventure travellers per square kilometre than other countries in the world (22.5 international eco-tourists/ km²)" (Kohlmann et al, 2008:256). In fact, Costa Rica's biodiversity has been a major reason for tourists and eco-tourists to visit this country and has contributed to making ecotourism the primary source for foreign currency generation. Kohlmann et al. (2008:256) states that during the last decade, ecotourism has surpassed coffee, bananas and beef production, which have been three traditional export products of Costa Rica. In 2007, tourism generated US\$ 1,895 million, while coffee generated US\$ 255 million and banana production generated US\$ 674 million in foreign currency.

In Costa Rica, natural resources have been used as the basic tools for development, but use of these alone will not contribute to complete conservation policies in the protected areas. On the other hand, a number of inefficient policies for development of ecotourism and conservation of natural resources have caused some problems which now have to be solved by Costa Rica's government and related organizations. In Costa Rica, unequal distribution of services is one of the problems in the protected areas. According to Weaver (1999:800), of approximately 23,000 to 25,000 total accommodation rooms, about 40% are located in San Jose and its environs, 30% in the Pacific province of Puntarenas (mostly as beach hotels) and 15% in the North-Western province of Guanacaste (also mainly as beach hotels). Most of the remainder are small facilities located within other provinces. Furthermore, the number of specialized "ecolodge" type rooms is around 500, or about 2% of the total inventory. These statistics expose that the output of the system in Costa Rica is likely to be depletion of capital and destruction of natural resources in one place and the exclusion of other places from ecotourism development.

In Costa Rica, partly as a result of financial constraints and the lack of compatible alternatives to traditional economic activities, there are several conflicts with the local population in the protected areas. For instance, Bernard et al. (2009:175) reveals that with the

change of the Rio Macho Reserve into a National Park in 2000, local activities such as coffee growing, livestock keeping, sheep and goat breeding, firewood collection, and harvest of mosses became illegal. The alternatives like the cultivation and harvest of wild blackberries, and the cultivation of colder climate fruits or cattle breeding are considered very unsatisfactory to the local people and they continue some of the illegal activities which damage the natural resources.

2.2.3. Ecotourism and Local Economic Growth

Sustainable ecotourism development depends on a particular economic system that is based on conservation of natural and cultural heritage and the contribution of local communities so they gain benefits from their sustainable activities. As GLOBE 90 (1990:2) reveal, one of the main goals of sustainable development of tourism and its related subsectors such as ecotourism is to develop greater awareness and understanding of the significant contributions that tourism can make to the environment and economy.

In some societies, particularly among the less developed countries, the shift from traditional to industrial strategies for economic development has caused destruction of the natural and cultural resources. Since post-industrialization, against the governing of people through technocracy, sustainability is viewed as a way of avoiding resource degradation and cultural decadence. In the following section, Thailand is used as a specific example as this is a country which has experienced traditional, industrial and post-industrial modes of economic development.

2.2.3.1. A Case Study of Thailand

Thailand is a country whose economy probably depends on the development of ecotourism. According to Wang (2004:1), 6% of the Thai GDP is derived from tourism and almost 30% of the population is employed in tourism and related industries. Furthermore, in Thailand, natural resources are considered the main attractive potentials which can contribute to development of tourism and an environmentally based economic system. Wang (2004:2) argues that there are eight categories of protected areas in Thailand which include: national parks, forest parks, wild life sanctuaries, non hunting areas, national forest reserves, botanical gardens, arboretums, and biosphere reserves. Pipithvanichtham (1997:2) points out that since the establishment of Thailand's first national park in 1961, the number of national parks in Thailand has slowly increased. For exam-

ple, there were only 16 parks which covered 9,357 km² in 1979, and this had grown to 45 parks covering 24,222 km² in 1982.

Between 1950 and 1980, Thailand underwent a massive transformation fuelled by overseas development aid and technical assistance, all facilitated by having a development oriented government. Wester and Yongvanit (2005:746) reveal that this transformation caused an ecological transition in some areas such as Dong Mun that was associated with rapid population growth, expanding demand for resources, increased connectivity and control by external forces and technologies that enlarged expectation, and environmental degradation.

Wester and Yongvanit (2005:738) also point out that until 1965 Thailand was in a pre-industrial mode. It had a common property regime which allowed local communities with small populations and limited technology to extract food, fodder, fuel and medicines from the land. According to Wester and Yongvanit (2005:738-739) after that date, forest management shifted to an industrial mode and exploitation of forests was part of the overall plan for regional economic development. This changed policy caused development of industrialised agriculture and infrastructures such as dams and roads and degradation of natural resources like the forests.

According to Wester and Yongvanit (2005:746), in Thailand the industrial mode happened first in the form of licensed timber concessionaires, who extracted the high value old growth wood, and later in the form of a plantation system based on single purpose, low value woods grown on land legally under the jurisdiction of the Royal Forest Department to the exclusion of all others. As a result of this policy, after 1970, severe reduction in the area of designated forest reserves occurred. Wester and Yongvanit further reveal (2005:736) that in 1961 approximately 53% of the land area was forested. Influenced by industrial development and unsustainable extraction of these resources, by 1986 the forested area had been reduced to 25% of total land.

After exploitation of natural resources during the industrialization period, the Thai government and related organizations attempted to find efficient strategies to recover and restore the lost environmental heritage while keeping a healthy economic system.

Since 1976, tourism development has been considered a significant solution to solving the latter issues. Pipithvanichtham (1997:1) points out that between 1976 and 1986 tourism in Thailand became the country's leading industry because of its generated revenue. However, as tourism became increasingly important, several areas which were subject to its development faced resource degradation and cultural decadence. Wang (2004:2) explains that although economic benefits as an output of tourism development have been claimed, outside investors reap the biggest benefits at the expense of the local communities.

The negative impacts of tourism development on the natural resources, local economic systems and socio-cultural structure led the Thai government and other organizations such as the Tourism Authority of Thailand (TAT) to shift their policy towards more sustainable tourism development, focusing on conservation and benefits to local communities. In the new strategy, local communities and indigenous people play an important role. In fact, as Wang (2004:4) suggested, the key to assessing tourism potential for improving nature conservation and community well-being is the direct involvement of local communities and improvement of the linkage between conservation and enterprise development. Consequently, this kind of tourism can be viewed as sustainable ecotourism.

Community Based Eco-tourism of Thailand (CBET) was introduced by Wang (2004) as a strategy whose development is based on the participation of indigenous people. One of the main goals for this system is the contribution to local well-being of the environmental economic development. He further states (2004:3) that the CBET approach is a response to the rising criticism of the negative impact of mass tourism and the abuse of the term ecotourism. CBET has attempted to establish a sustainable method of tourism in natural reserves while providing a source of community-building or development for indigenous participants without exploitation of their natural habitats and cultural structures. Wang (2004:3) points out that there is a difference between community-based ecotourism and other types of tourism because the former focuses on community development and the participation of the marginalized sectors rather than on national or regional development.

For more explanation about the CBET and its impacts on local societies, Wang (2004:6) chooses to describe two hill-tribe villages from Mai Hong Son Province, Northern Thailand. Mae Huay Hee village has been involved in CBET for more than 5 years and the degree of participation in tourism is high. In Mae Lana, approximately 80 km away from Mae Huay Hee, the CBET initiative started only one year before the reporting, although the locals had been involved in tourism for almost 10 years. A comparative study between these two villages that were receiving different degrees of tourist activity and experiencing different levels of participation was conducted to judge the impact caused by CBET. The positive impact of CBET which is described (Wang, 2004:7) can be attributed to the low number of tourist activities and the fact it is a controlled activity. In addition, participation of local people in conservative projects and development of an environmental economic system which “is based on the idea that environmental goods and services are scarce” (Graaf et al, 1996:208), are other positive impacts of CBET.

In comparison with other types of tourism, ecotourism and its related activities which have particular characteristics need specific management and consideration to be correctly implemented. Wang (2004:10) reveals that in comparison with other projects, ecotourism projects are hardly likely to succeed immediately and yield immediate profits. Even one successful project may need a lot of time to adapt to a new situation. When there is conflict between the efforts to keep the number of visitors low to minimize cultural and environmental intrusion and the local people’s desire to increase their income, alternative forms of livelihood should be encouraged.

2.2.3.2. The Potential of Ecotourism

In conclusion, ecotourism projects should not be viewed as an enterprise that will solve all issues. Consequently, it is necessary for related communities to integrate ecotourism with other alternative productive options to reduce the expectations placed on having one activity alone, and to reduce the tensions that arise from unmet expectations. Wang (2004:12) argues that community-based ecotourism is a “multi-dimensional productive and cultural/social system” which is not an isolated industry from other economic activities. This system will lead to stability in the economy at the national, regional, or community levels.

Ecotourism is not a ‘magic bullet’ that will suddenly result in conservation of natural resources at the same time as development and increased foreign revenue. It can skew development within a country, such as the development of a few places within Costa Rica for housing and servicing tourists. At best, ecotourism that gives at least part of its benefits back to the local communities that support it can have positive outcomes but these may be slow to arrive and may not meet the expectations of those involved. In some ways the problems of ecotourism establishment can be seen as a mirror at a small scale of the problems of trying to move the whole world economy on to a much more sustainable basis. Both will only succeed if those involved expect less, rather than more. For the eco-tourist, less might mean less comfortable travel and accommodation and for the local people involved, less might mean a lower level of life style improvement. However, the big benefit of ecotourism is that local natural resources are conserved to a much greater extent, which is the basis for all sustainability.

2.2.3.3. Definition of Soft Ecotourism in this Thesis

Arising from the environmental and economic characteristics of ecotourism discussed above, soft ecotourism can be defined as a part of sustainable tourism that happens in rural and urban places and their adjacent areas. Soft ecotourism aims to make local and indigenous people aware of their environmental and cultural heritage and capital and engage them in the sustainable development process. This process includes conservation of natural resources and social-cultural heritage, production and development of environmental and the social capitals, and development of an ecological-social economic system in a sustainable way.

2.2.4. Strategy for Sustainable Development of Tourism

The anticipated goals and outcomes of tourism plans will inevitably determine their role for environmental protection, social and economic development. According to Fennell and Dowling (2003:8), at the beginning of the last two decades, some researchers such as Murphy (1983) and Getz (1986) argued that most tourism goals and planning were oriented towards business interests, economic growth and development. However, influenced by some phenomena such as global warming, degradation of environmental resources, and evolution of sustainability policies, the strategies for tourism development have been oriented to being more comprehensive to cover the multi dimensions of the sustainability of tourism. This thesis uses the New Zealand Tourism Strategy 2015

(2007), as an example of the recent frameworks, here suggested by the government of New Zealand, for the sustainable development of tourism.

2.2.4.1. New Zealand's Tourism Strategy 2015 (2007)

During the last two decades, New Zealand's attitude to defining the best kind of tourism for the country has changed. "Twenty years ago, the debate about what kind of tourism would be the best for New Zealand largely centered on how many international visitors would be appropriate" (New Zealand Tourism Strategy 2015, 2007:14). Now tourism is viewed as a much more complex phenomenon. For New Zealand's government and related organizations, there are many factors which must be considered to achieve their goal of becoming a sustainable nation and promote the value of tourism to New Zealand's visitors, economy, environment and communities. According to the New Zealand Tourism Strategy 2015 (2007:14) these factors include the money that visitors expend whilst they are in New Zealand, the time of year they come, and the sort of experiences they expect during their travel. In order for the tourism sector to prosper, the New Zealand Tourism Strategy 2015 suggests increasing the amount that each visitor spends during their visit, finding strategies to reduce seasonal fluctuations in visitor arrivals, and providing products that are appropriate for visitors who are concerned about their environmental footprint. The structure of the NZTS 2015 sets out four outcomes needed to achieve these goals, as shown in Table 2.2.

Table 2.2: Anticipated outcomes for sustainable development of tourism in New Zealand's Tourism Strategy 2015

Outcome	Description
Outcome 1	New Zealand delivers a world-class visitor experience.
Outcome 2	New Zealand's tourism sector is prosperous and attracts ongoing investment.
Outcome 3	The tourism sector takes a leading role in protecting and enhancing New Zealand's environment.
Outcome 4	The tourism sector and communities work together for mutual benefits.

• Reference: (NZTS 2015, 2007:6-7)

Together these four outcomes (Table 2.2) shape a suggested framework for the development of sustainable tourism in New Zealand by 2015. As demonstrated in Table 2.2, the anticipated outcomes for sustainable development of tourism can be categorized into the four categories of promotion of the quality of services and products, economic development in a sustainable way, environmental conservation and engagement of the local communities and related organisations in the development process. In the next part of this Chapter, the four outcomes and their related contributive activities as forecast by

the New Zealand government for the sustainable development of tourism are explained as an example of a sustainable framework and strategy for tourism.

a. Outcome1: New Zealand Delivers a World-Class Visitor Experience

World class experiences are authentic, unique and delivered with superb service. To achieve this goal the New Zealand government suggests a range of priorities for its delivery, which are shown in Table 2.3. These priorities can be conceptualised as increasing the quality of planning, management and monitoring of the offered services, facilities and products, and the economic and cultural engagement of local people and communities in the development process (Table 2.3).

Table 2.3: NZTS 2015- setting priorities to deliver a world-class visitor experience (Outcome 1)

No.	Priorities for delivery
1	New Zealand is seen by visitors as a desirable, high-quality destination
2	The New Zealand tourism industry offers booking services that are easy to use
3	The I-Site network is recognized by visitors as being a source of high-quality and objective visitor information
4	Qualmark is recognised by consumers as a mark of quality
5	The tourism sector is committed to monitoring visitor satisfaction and perceptions of quality
6	New Zealand's infrastructure supports a quality visitor experience at all stages of the journey
7	Domestic travelers help create a strong demand for visitor products and services
8	Maori actively participate and invest in the tourism sector

The New Zealand government proposes a list of necessary activities related to each priority (cited in Table 2.3) which must be done to achieve that priority. These activities can be summarised as development of investment in tourism at global and domestic scales; promotion of quality and accuracy of researches related to both domestic and international tourism markets; using appropriate technology for each activity, service and product; monitoring the quality of all related activities, facilities and products used; managing and monitoring of the engagement of local and indigenous people (Maori) in the development process, and encouraging them to present their cultural product at world-class level (see Appendix1).

b. Outcome 2: New Zealand's Tourism Sector Is Prosperous and Attracts Ongoing Investment

Outcome 2 proposes an economic aspect of sustainable development policies for the tourism market in New Zealand. Based on this economic perspective, NZTS 2015 assumes that "the success of New Zealand's tourism sector is ultimately dependent on the performance of the businesses within it. If they are successful, the sector will keep

growing, which will deliver significant benefits to businesses themselves, to their communities, and to the New Zealand economy as a whole” (NZTS 2015, 2007:30). The New Zealand government also offers five priorities for a successful tourism sector and these are shown in Table 2.4.

No.	Priorities to deliver
1	Tourism businesses identify and put in place strategies that will consistently increase their returns on investments.
2	Business delivers products and experiences that meet the expectations of high-value visitors.
3	Tourism attracts and retains an appropriately skilled workforce.
4	The tourism sector improves demand during the off-season.
5	New Zealand’s tourism research is accessible, timely, high quality, and relevant to the decisions that need to be made.

The main objectives of the proposed economic priorities (Table 2.4) can be considered as a contribution to increasing returns on investments; increasing the quality of products compatible with the expectation of consumers; and increasing the demand for conducting researches in the context of the sustainable tourism strategy.

NZTS 2015 introduces the main actions that must be conducted to achieve the priorities for a prosperous tourism sector. These activities can be summarised as community based actions that aim to improve resource efficiency; work force management; tourism services, products and facilities; and access to researches and information systems. In addition, training and education of the workforces involved is considered to be one of the pillar activities to make tourism economically successful in a sustainable way (see Appendix 2).

Likewise, NZTS 2015 values both international and domestic tourism at the same level and aims to develop them both to improve the economic benefits of tourism in New Zealand. For instance, NZTS 2015 proposes investment in marketing initiatives that target domestic and international visitors who are more likely to travel in the shoulder and off-peak seasons (see Appendix 2). As a result, increasing the number of visitors, both domestic and international, can be viewed as one of the main goals and activities to support the economic development of tourism in New Zealand up to 2015.

c. Outcome 3: The Tourism Sector Takes a Leading Role In Protecting and Enhancing New Zealand's Environment

The third anticipated outcome for the sustainable development of tourism demonstrates an ecological aspect of the tourism strategy in New Zealand (Table 2.2). NZTS 2015 views tourism as a phenomenon that can contribute to environmental conservation through its sustainable development. To achieve this goal by 2015, the New Zealand government suggests eight priorities for tourism development in terms of environmental conservation to be followed by the tourism sector and related organisations (Table 2.5). These priorities consist of maintaining environmental resources for the next generations; producing environmentally friendly products through the development process; reducing the carbon emission of the products, services and activities of tourism; using renewable energies in the tourism sector; and management of produced waste in a sustainable way through interaction with other related sectors (Table 2.5).

Table 2.5: NZTS 2015- setting priorities to protect and enhance New Zealand's environment (Outcome 3).

No.	Priorities for delivery
1	The tourism sector contributes to a whole-of-New Zealand approach to ensure that New Zealand's environment will continue to be enjoyed by future generations and visitors, in the spirit of kaitiakitanga (guardianship)
2	The expectations of our visitors are clearly understood, and visitors are able to identify and select products that deliver good environmental performance easily
3	The tourism sector leads the way in introducing initiatives that will reduce carbon emissions and increase the energy efficiency of transport within and en route to New Zealand
4	The tourism sector improves its energy efficiency, energy conservation, and use of renewable energy at all levels
5	The tourism sector takes active steps to reduce and manage its waste, encourages other sectors to do the same, and engages with the local, regional, and national agencies that provide waste management standards and facilities
6	Tourism businesses have the capability and knowledge to take a leading role in protecting and enhancing the environment
7	The tourism sector, DOC, and other key agencies continue to work together to make sure that conservation values are enhanced
8	Visitors' tourism experiences give them the opportunity to learn about and contribute to New Zealand's environmental and conservation goals

NZTS 2015 determines necessary activities to make tourism development an ecologically friendly phenomenon. These suggested activities contain some key points such as providing a national environmental plan to be followed by New Zealand and its tourism sectors; participation in global forums that attempt to manage and monitor environmental issues; contribution to stronger sustainable environmental policies, regulations and standards; and development of ecological indicators that can be used as tools to measure environmental impacts of tourism (see Appendix 3).

Furthermore, NZTS 2015 proposes use of products, services and facilities such as transportation with fewer carbon emissions and involving less non-renewable energy. Renewable resources are seen as the main sources of energy to be used through the sustainable development process at both international and domestic levels (see Appendix 3).

d. Outcome 4: The Tourism Sector and Communities Work Together for Mutual Benefits

NZTS 2015 views sustainable development of tourism as a community-based activity that attempts to engage local communities and participants in the whole development process including its planning, management and monitoring (Table 2.6). The forecasted priorities by NZTS 2015 (Table 2.6) also focus on making opportunities for local participants to produce and present their cultural products and conserve their cultural heritage through the sustainable development of tourism. This policy is linked with local economic development in a sustainable way (Table 2.6).

Table 2.6: NZTS 2015- setting priorities for the tourism sector and communities to work together (Outcome 4)

No.	Priorities for delivery
1	The tourism sector is an active partner in planning and managing our communities
2	Local authorities understand the benefits tourism offers and lead destination management and planning initiatives and progress to maximise the benefits
3	Tourism decision-making by local government, communities, Iwi, and the tourism sectors is informed by high-quality research
4	Regions and communities preserve and promote their local culture and character and incorporate this into all aspects of the visitor experience
5	Core infrastructure and facilities are appropriately funded

Appendix 4 shows a range of community based activities suggested by NZTS 2015 which can support New Zealand tourism sectors to be more socially sustainable through engagement with local participants and communities. The latter community based activities cover the social dimension of the sustainable development of tourism and, in some aspects, are linked with the environmental and economic dimensions of sustainability. For instance “making sure that high-quality research is available to local communities to inform decision-making by local government and the tourism sector, including information on the social, economic, environmental, and cultural benefits of tourism to communities” (NZTS, 2015) can be considered as an educational policy and activity that attempts to make local people aware about the linkage between the environmental, social and economic dimensions of sustainable development.

Some of the suggested activities that can contribute to the New Zealand tourism sector becoming a socially sustainable activity, for example “assess core needs, and investigate and consider funding models to improve the standard and provision of appropriate infrastructure” (NZTS, 2015), also benefit this sector in the achievement of other forecasted outcomes, such as “deliver[ing] a world-class visitor experience” as cited in Outcome1 (Table 2.2).

2.2.4.2. Discussion

NZTS -2015 attempts to propose a framework that has the ability to cover all the different dimensions of sustainability through development of tourism. As discussed above, its four anticipated outcomes (Table 2.2) have the ability to lead tourism sectors and their related services, products, facilities and activities to develop in a sustainable way with positive social and economic effects and lower negative environmental impacts. This strategy can be viewed as a bottom up approach to a democratised development process that in turn will be supported by the New Zealand government.

However, some of the forecasted priorities for the sustainable development of tourism (in particular economic and environmental priorities) might cancel each other out. For example “invest in marketing initiatives that target those domestic and international visitors who are more likely to travel in the shoulder and off-peak seasons” (Appendix 2), can increase the number of international visitors that in turn increases the ecological footprint of tourism in New Zealand, itself a national and global environmental issue. Although the development of ecological indicators is suggested by NZTS 2015 as an environmental strategy for New Zealand tourism (Appendix 3), can support the tourism sectors to do more accurate planning, management and monitoring of their services, activities and products as being sustainable.

2.3. Sustainable Architecture

2.3.1. Historic Perspective on Sustainable Architecture

Architecture is one of humanity’s products. Its historic roots lie in the connections between the environment and its inherent potential to provide comfort and security for the inhabitants. Williams (2007:103) argues that architecture up until 100 years ago had to be ingenious in providing comfort by integrating passive elements of the natural place

into a design solution. Williams (2007:103) encapsulates these passive elements, including warm air rising, prevailing breezes, ventilation chimneys, floor plans proportioned and oriented to provide daylight and fresh air to all users, unique methods of construction, virtual elimination of waste, a symbiotic relationship between the structure and the materials needed to build it, and the reuse or return to the earth of the materials after they are used. The use of these elements was the very foundation of an architectural and planning profession which was based on sustainable principles before sustainability was defined.

Sustainability and sustainable architecture can be considered as a phenomena rising from the traditions as officially defined in the modern style. Steele (2005:12) reveals that in the spirit of its Latin origin, 'tradere' means 'to carry forward'. In this context tradition essentially represents the accumulated knowledge of past generations in relation to effective ways of dealing with the environment. In turn this led to place-specific techniques that historically have been used to control microclimates by the people that live in them.

There are many examples where traditions and technology have met each other to create an ecological or sustainable architecture. Steele (2005:15) argues that since there are traditions of technology in dealing with the environment, and as tradition itself is based on making, which is the essence of technology, to set tradition and technology against each other is to establish a false dialectic. Steele (2005:15) suggests that a more accurate approach might be to try to discover where tradition and technology concur or overlap and how this may be applied to environmental problems.

As an example of this approach, Gissen (2009:125) cites Hassan Fati's [also Fathy] work in Egypt. Beginning with designs in 1973 and after several experimental developments that were completed years later, Fati developed mud construction techniques (as a compatible technique for the environment and traditions) for the sake of helping impoverished rural populations. Gissen (2009:125) states that, significantly, Fati's work provided a material-based construction language for a postcolonial approach to architecture. Fati's mud architecture was characterized by its use of validated construction techniques to make an ecological linkage between the materials and energies resident in a place, architecture, and people as consumers. On the other hand, Fati's architecture

which is characterized by being environmentally sensitive, culturally appropriate and economically viable, can be considered as an effort based on the combination of traditions and techniques, to create a sustainable architecture and to shift a society toward sustainability.

As will be explained in the next section, the characteristics of architecture discussed above also appear in vernacular and traditional architectures that have historic backgrounds and that are still used as places for living.

2.3.2. Learning from Vernacular Architecture

Humanity is in a period of luxury development, which has been raised by the needs of capitalism to create new markets, and the technological advancement that exerts influence on every aspect of human lives. Because of this it may be unfashionable or impossible to regress in time and place to live in vernacular buildings in a vernacular manner. However, the dominant principles in vernacular architecture can be used to make frameworks and guidelines to create an architecture which is correspondent with nature, social-cultural values and local economic systems. Oliver (cited in Kazimee, 2008:4) states that almost 90% of the world's housing shortages will be met with self-help means, using locally available resources and technologies and not through high-tech and specialized methods. Kazimee (2008:4) explains that in applying the properties of vernacular architecture to current times and seeing in the vernacular a solution for modern urban problems, it is the notions of flexibility and working in traditional ways that are important.

Vernacular cultures generated buildings and spaces that are accommodating of time and place. Creating multifunctional and flexible spaces to be used at different times for different activities (which Kazimee introduces as a characteristic of vernacular architecture), has been suggested by Vale and Vale (2009:129) as an option for optimizing the use of space where it is limited. Vale and Vale (2009:129) use a caravan as an example of timetabling various uses in a multi-functional space. In a caravan "the same space is used for eating and later, when the table and benches have been converted into a bed, also for sleeping. Where movement or transport is involved, timetabled use of space is common" (Vale and Vale, 2009:129).

2.3.2.1. The Clustered Villages of Nuristan- Afghanistan

Kazimee (2008) describes the villages of the Nuristan region, located in the rugged geographical region of northeast Afghanistan, as fine examples of sustainable communities. This is because they are adapted to the harsh cold climate zone of the southern slopes of the Hindu Kush Mountains and residents depend on local resources for building their homes and villages. He (2008:6) explains that these villages are clustered on the steep slopes of the mountain sides because there is a limited amount of arable land available in the Hindu Kush, so the lower valley and flat land is saved for agriculture and grazing. Kazimee (2008:6) points out that the roofs of the dwellings are constructed above each other, so that one household's flat roof serves as the patio for the neighbor above (Figure 2.5).



Figure 2.5: Nuristan village, Afghanistan
http://viaterra.net/photos/pakistan/pakistan_nuristani2.jpg
viewed December 2010

According to Kazimee (2008:6) these stepped roof areas with their verandahs provide the necessary flat exterior space or patios for many domestic and social tasks. In addition, as Kazimee (2008:6) points out, the patios are connected to each other with notched logs used as ladders that serve as pathways for the vertical movement of people through the village. This using of roofs as patios and pedestrian pathways can be viewed as an example of the creation of multi-functional spaces to avoid wasting arable land.

Kazimee (2008:7) further states that in the villages of Nuristan, people use local materials such as wood, soil and stone to construct their homes. The main stages of construction are conducted by the landowner with the help of neighbors if necessary. Participation of landowners and neighbors makes the construction process become a community based activity. According to Kazimee (2008:7) the south facing terraced houses on the hill respond logically to the climate and solar orientation, taking full advantage of the

opportunities to save energy through clustering, be heated by solar energy, and therefore create a more comfortable environment for the residents.

Nuristan's villages represent a participatory paradigm of construction using the local and available materials and energies. These villages can be used as an example of an optimized pattern of using an area of poor land for construction to save other natural resources. Agriculture is the main economic activity in these villages and is conducted by traditional methods to provide food for the residents. In this way, these villages are behaving like organisms which are linked with and adapted to nature. The principles that are dominant in the construction process, social-cultural structure and economic system of Nuristan's villages can also be considered as guidelines and principles for architecture created through sustainable development.

2.3.3. Sustainable or Green Architecture

Sustainable architecture is a comprehensive phenomenon in which many different subjects such as community based activities, design and planning (at different scales), resource consumption (materials and energies), cost, and nature, are interwoven in the interest of creating functional spaces and structures which meet the principles of the strong model of sustainable development. Wanlass (2005:1) proposes that sustainable architecture can be looked at as two different branches of thought that affect one another. Wanlass (2005:1) explains that an evaluation of the impact of current building materials and use of energy in buildings, and finding better socio-ecological solutions (green building) is one branch and, more importantly, rethinking the way in which architecture is conceived from the beginning, using the metaphor of "architecture as an organism" forms the other branch.

Williams (2007:15) points out the main characteristics of sustainable design and hence sustainable architecture. He (2007:15) states that sustainable designs function using available sustainable energy supplies. Furthermore, "sustainable designs last; they are flexible; they are loved and cherished; they endure; they function when they are tethered to [non renewable resources] and also when the [non renewable resources] are unavailable. Sustainable architecture can function in a blackout or a drought or natural disaster or on a beautiful day without any input from non renewable resources" (Williams, 2007:15). This idea that sustainable architecture must function independently of non

renewable materials and energies makes a boundary between the modernist idea that architecture is a mechanism or machine and the other idea that view that architecture is an organism. Wanlass (2005:1) points out that if architecture is imagined as an organism instead of a machine, a new idea is created about how it will interact with its environment. He (2005:1) argues that while architecture as a machine is thought to function independently of its environment (which it does not), an organism has a balanced existence with its surrounding nature, responding to changing conditions, and going through a predictable life cycle.

If sustainable architecture is defined as an organism compatible with its environment, then green architecture can be viewed as an element of this definition. Williams (2007:16) reveals that green buildings and communities that integrate the local conditions and natural resources, create healthy interior spaces with natural light, and have complete recycling and reuse of materials are critical to the development of a sustainable future. He (2007:16) argues that although green buildings that efficiently use grid based non renewable energy slow the energy and pollution crisis, if the energy sources powering these buildings are unsustainable, the design is not sustainable.

The main characteristics of a sustainable architecture that make it different from a green architecture include continuing, surviving, thriving, and adapting. According to Williams (2007:16), green design incorporates ecologically sensitive materials and creates healthy buildings and processes that do not negatively affect the environment before, during, or after manufacture, construction, and deconstruction. It also incorporates efficient mechanical systems and high performance technologies. However, it still functions primarily through the use of fossil fuels. In sustainable architecture, buildings are viewed as a part of an organism instead of being a machine (even a very efficient machine) for living in. Its inputs are natural and renewable energies and materials and its outputs are the used materials which can be easily recycled or absorbed by nature or reused to build new buildings and infrastructure. This implies that the people using the buildings must also be part of this organism and that their behavior has to follow the same rules as set out for the building. This suggests a significant change to current globalised consumer culture.

2.3.4. Sustainable Architecture and Environment

Sustainable architecture as an organism has an ecological interaction with its environment. Together the sites and regions play a significant role as they supply the renewable energies and materials used in the buildings. As a result sustainable design has responsibility for protecting its natural environment by optimization of the use of spaces and areas. This responsibility can be conducted by using local renewable materials for construction and manufacture with low embodied energy and less ecological footprint (EF). As can be seen in the Nuristan example above, using open spaces as part of architecture with individual, common or multi functions can contribute to the extension of indoor-outdoor interaction and optimize the use of occupied areas. For instance, according to Vale and Vale (2009:176), a local open-air market which can be conducted in a multi functional open-air space, with an EF of 0.8 gha per year has the lowest ecological footprint among other types of places for shopping, including a neighborhood supermarket, low energy supermarket (energy efficient) and low energy supermarket (energy-generating).

Sustainable architecture can be defined as a community based phenomenon that needs to be designed, managed and monitored at the scale of the building, site and region. As a building has a close relationship and interaction with its surroundings (as an element of an organism), its designer(s), constructor(s) and user(s) must have interaction and communication with other participants of the community where the building is situated.

2.3.5. Sustainable Architecture and Culture

As a cultural product, architecture can make manifest the different cultural dimensions of a given society. Likewise, both the negative and positive reactions of a culture towards the environment can exert influence on its architecture (as a component of the cultural system) to being compatible or incompatible with the environment. Torres and Sakamoto (2004:19) point out that the built environment with architecture as one of its components is influenced by the society and its cultural system that produces it. On the other hand the cultural system of a given society can make an architectural framework that determines the materials and energy sources used, the size and function of spaces, the interaction between a building and its neighbors, the maintenance of privacy and security, and the form of spaces and their elements. As Torres and Sakamoto (2004:19)

state, buildings also function as a link between the material world of nature and the symbolic world of human cultures.

To take these ideas further, this next section is included to demonstrate the mutual relationship between architecture and a given society (in this case Kerman). In this section, architecture is considered as a product that can exert influence on and be influenced by the ecological ethics of a given society, its social (spiritual and physical) behaviors and economic system. The section demonstrates the main characteristics of an architecture that could contribute to the social, environmental and economic development of a society.

These examples have been selected because they are more self-contained and demonstrate these relationships much more clearly than the architecture of the west, such as that of New Zealand, which has been influenced by global cultural values. Kerman city, which is 1500 years old, clearly shows the link between culture and architecture, as the forms and materials of its streets, buildings and even its services have been influenced by and evolved in parallel with, the culture of its inhabitants over a long period of time.

2.3.6. The Historical City of Kerman

The author has previously worked on the Comprehensive Plan for Restoration of the Historic Parts of Kerman City - Iran (1989-1990). Kerman is a city with a rich historic heritage that demonstrates a compatibility between architecture and environment that has been sustained for more than one thousand years. This is a practical example of the main characteristics of sustainable architecture as determined by researchers such as Williams (2007) and Steele (2005). This section introduces the different ecological, cultural and economic dimensions of architecture and their interaction with each other that must be considered for development of soft ecotourism and its architecture.

2.3.6.1. General View of Kerman City

Kerman is one of Iran's oldest cities and has always been an important centre on the trans-Asian trade routes. It is believed to have been founded in the early 3rd century AD by Ardashir I, founder of the Sassanian dynasty.

Kerman is located on a high margin of Kavir-e Lut (Lut Desert) in the central south of Iran (Figure 2.6).



Figure 2.6: Kerman city and Kerman province, Iran

<http://geology.com/world/iran-satellite-image.shtml> viewed August 2012

The climate in the province varies in different regions depending on the relief of the land. The north, northwest and central areas experience a dry and moderate climate, whereas in the south and southeast, the weather is warm and relatively humid. The desert trading city of Kerman has long been a staging point for people passing between Persia and the Indian subcontinent, and for tourists today it remains the best place from which to explore the southeastern region of the country. The city's many districts are surrounded by mountains which bring variety to Kerman's year round weather pattern, thus the northern part of the city is located in an arid desert area, while the highland of the southern part of the city enjoys a more moderate climate.

The city of Kerman (with the mean elevation of 1755m above sea level) and the surrounding regions have a semi-moderate and dry climate, with maximum and minimum temperatures of 39.6°C, and -7°C respectively. Kerman city has a moderate climate and the average annual rainfall is 135 mm. Because it is located close to the Kavir-e Lut, Kerman has hot summers and in the spring it often has violent sand storms. The average monthly temperatures during the March – June period have been recorded as ranging from 20° - 25°C.

Kerman city can be divided into the two historical and modern parts. The historical part is located in the center of the city and surrounded by districts of modernized development. The area surrounded by the red line in Figure 2.7 shows the core of the historical part of Kerman.

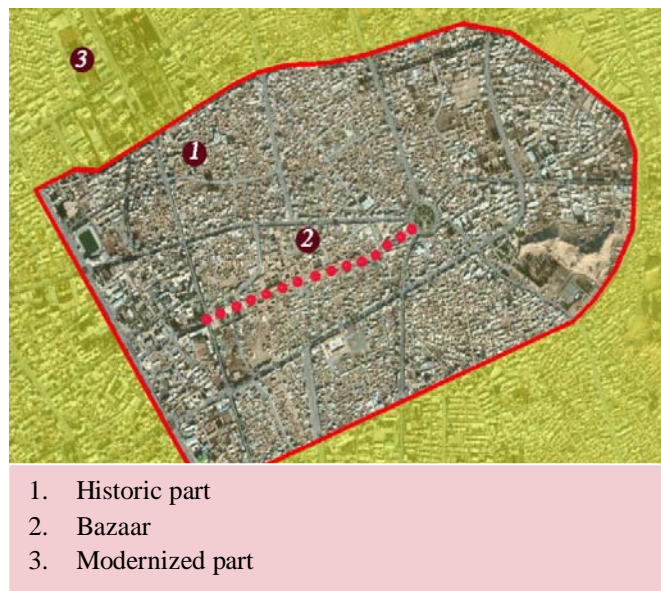


Figure 2.7: Historical districts of Kerman city which are linked by the Bazaar
Google Earth viewed September 2011

2.3.6.2. Kerman City - Structure and Elements

a. Bazaar

The traditional bazaar of Kerman, as a backbone for the city, plays an important role in shaping and organizing the other public and residential areas of Kerman. In particular, it reflects the values of the Safaviyid Dynasty (1502–1736 AD). In Kerman (as an example of the Islamic cities of Iran) the bazaar is a multi-functional element. It functions as the economic heart of the city and, synchronously it functions to connect together the

mosques, baths, caravanserai, and other common services in an attempt to enclose all areas of life in a harmonized architecture.

The bazaar is used as a covered pedestrian pathway during the cold and hot seasons for access to the different parts of the city (Figure 2.8, left). Every Friday when people want to attend Friday prayer which is held in the Friday Mosque (the biggest mosque of the city called “Masjed-e Jame”) they use the bazaar as the main access to it. Consequently, even on Fridays which are public holidays when the commercial buildings are closed, the bazaar still lives. Kerman’s bazaar has two main branches (orders) that intersect each other at a four way stopping point. This intersectional place is called “Chahar Sogh” (four-leads) (Figure 2.8, right).



Figure 2.8: Left, Bazaar,
<http://www.flickr.com/photos/lfphotos/1248475691/> viewed September 2011



Right, Chahar Sogh
http://www.avayeettehad.ir/farsi/tour/kerman/255428_orig.jpg
 viewed September 2011

In comparison with other elements of the bazaar, because of its function as the junction between the two main branches of the bazaar, Chahar Sogh occupies a bigger and higher space. The roof of the bazaar is covered by a series of domes structured using brick (Figure 2.9). The dome which covers the Chahar Sogh area also has a bigger diameter and size than others in the bazaar (Figure 2.9, left).



Figure 2.9: Left, the dome of Chahar Sogh
http://farm2.static.flickr.com/1261/4725357313_4e813a189f.jpg viewed September 2011



Right, bottom up view of the roof of Bazaar
http://i1.trekearth.com/photos/38865/coppersmith_bazaar.jpg viewed September 2011

b. Materials

Building construction in Kerman was influenced by the available natural materials and in particular the soil and water used to produce brick and sun-dried brick. These materials are environmentally compatible with the surrounding climate and desert terrain. Using these materials contributes to reducing climate extremes, such as temperature difference between indoor and outdoor spaces during the hot and cool seasons.

In addition mud is the main material used to produce enamelled tiles. However, different metal oxides and natural resins must be applied to create the enamel tiles and enamelled bricks that are used as finishing and decorative elements. Furthermore, all other materials such as chalk (gatch), lime, sand and natural pigments have been produced locally by using natural resources. Based on using natural resources for construction, the traditional architecture and urbanism created can be viewed as a part of the environmental materials and energy flows in the city.

c. Qanat (Subterranean Channel)

In the early part of the first millennium B.C., Persians started constructing elaborate tunnel systems called Qanats for extracting groundwater in the dry mountain basins of present-day Iran (Figure 2.10).

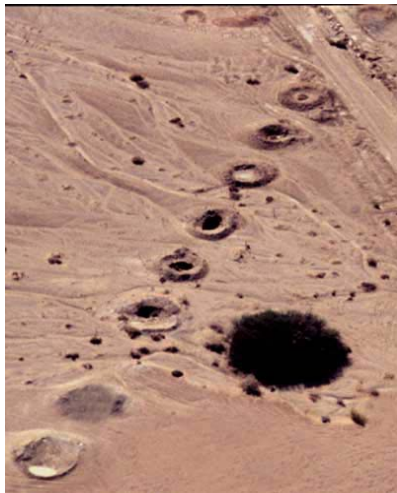


Figure 2.10: Left, top view of Qanat
<http://thma02.yimg.com/nimage/75d2a55357471914> viewed October 2011



Right: Inside of Qanat
<http://www.mondellolido.it/pagine/cenni%20storici/lo%20cascio/immagini/qanat02.gif> viewed October 2011

These Qanat tunnels were hand-dug, and consequently some are just large enough to fit the person doing the digging. Along the length of a Qanat, which can be several kilometres, vertical shafts were sunk at intervals of 20 to 30 metres to remove excavated material and to provide ventilation and access for repairs (Figure 2.11).

The main Qanat tunnel sloped gently down from pre-mountainous alluvial fans to an outlet in a village or a city. From there, canals would distribute water to fields for irrigation or to residential places for consumption. These amazing structures allowed Persian farmers to succeed despite long dry periods when there was no surface water to be had. Many Qanats are still in use, the technology stretching from China in the east to Morocco in the west, and even to the Americas.

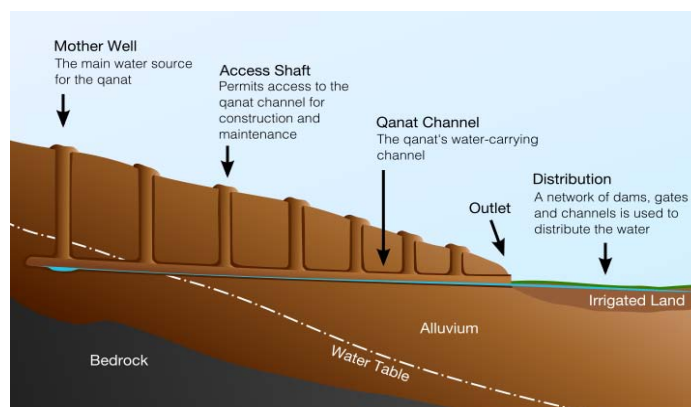


Figure 2.11, Cross section of a Qanat
<http://diyscholar.files.wordpress.com/2010/09/image-110.jpg?w=330&h=204>
 viewed October 2011

There are significant advantages to a Qanat water delivery system including the following:

1. Putting the majority of the channel underground reduces water loss from seepage and evaporation;
2. Since the system is fed entirely by gravity, the need for pumps is eliminated; and
3. It exploits groundwater as a renewable resource.

The third benefit warrants additional discussion. In Kerman, water in Qanats flows in tunnels beneath residential areas and surfaces near the cultivated area. Staircases from the surface reach down to these streams. The first access is usually at a public cistern where drinking water is available to the entire community. Sometimes these cisterns are sizable vaults as much as 10 metres across and 15 or more metres deep with spiral stairs leading down to small platforms at water level.

In the cities such as Kerman, these cisterns are ancient constructions encased in tile. Other more modest urban access points are found along major streets, and even in some alleys, a factor that probably played an important role in the social and physical layout of the town. The Qanat can be viewed as an element of Kerman which makes a sustainable linkage between the city as an organism and the environment as the main source for the supply of clean water.

2.3.6.3. Form and Structure

Herdeg (1990:37) reveals that three fundamental layers of spaces and activities make up the Islamic cities of Iran. “First above the datum plane of the roofs, [are] the sculptural objects including domes, wind towers, etc. (Figure 2.9, left), second below that datum, courtyards of every kind and size, (Figure 2.12), third, spaces on the ground usually denoting circulation (Figure 2.9, right)” (Herdeg, 1990: 37).

a. Courtyard

In Kerman, the open air space of the courtyard can be seen as one of the dominant forms of the urban structure, being used at the scale of both urban form and architecture. As shown in Figures 2.12 and 2.13, the unity of the city fabric is reinforced by the use of courtyards with different scales and functions but similar geometry, form and materials.

According to the figure ground (Figure 2.14), the city fabric can be separated into the three morphological objects of, courtyards as public and individual open air areas (white coloured rectangles in Figure 2.14), built area as parts of individual or public buildings (black coloured areas in Figure 2.14), and streets (white lines in Figure 2.14). The latter are not merely streets but also appear as gaps between buildings with organic form.

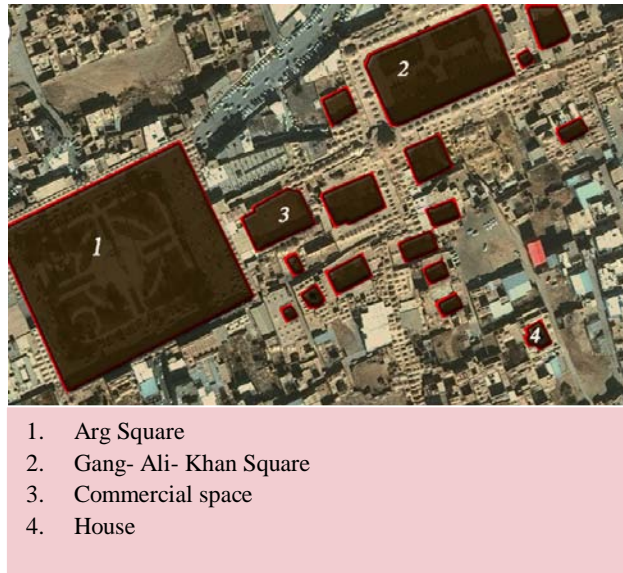


Figure 2.12: The courtyards (dark areas) with different functions in the historical part of Kerman. Google Earth viewed October 2011

At the urban scale, courtyards form the public spaces such as Arg Square (Figure 2.12, No.1) and Gang Ali Khan Square (Figure 2.12, No.2) which connect other urban spaces and services to each other. Courtyards also form the central open spaces of commercial buildings and collections such as caravansaries, and the central open spaces of mosques called “Sahn”. Courtyards as public spaces play a role in the holding of some religious and public customs (Figure 2.13).



Figure 2.13:
Left: Arg Square, Ashora Funeral Custom.
<http://innocent.persianguig.com/image/Kerman%20Ghadim/Saeed017.jpg> viewed December 2011

Right: Gang Ali Khan Square
http://farm2.staticflickr.com/1383/4725402177_c052e0c31b_z.jpg viewed December 2011



Figure 2.14: The open space (white areas) and built areas in the historical part of Kerman (Herdeg, 1990:37)

At the scale of architecture, the courtyard is an open air area located in the centre of houses (Figure 2.15). It connects the northern and southern parts of houses which are used seasonally. Northern areas (Shah Neshin) are used during the hot seasons (Figure 2.15, right) and southern spaces (Figure 2.15, left), which receive the sunlight during the cool seasons, are appropriate to live in during autumn and winter. Furthermore, the courtyard plays an important role in dividing private spaces from semi-common spaces in a house. Indeed the relationship between the courtyard and other elements of the circulation system, such as the vestibule (Hashti) and corridors, forms a hierarchical circulation system in a vernacular house to protect the privacy of the residents and contribute to the facility of access to different spaces.

As shown in Figure 2.15 (left) during the hot seasons, people use the courtyard as a place to sleep at night. The existence of a pool in the centre of the courtyard contributes to reducing temperature during summer. In addition, people use the water from the pool for washing and cleaning and children use it as a place for swimming during summer.



Figure 2.15: Left, courtyard used in summer as open air bedroom
http://nazaronline.ir/files/fa/news/1389/7/3/1309_325.jpg viewed October 2011



Right, courtyard connects all internal spaces to each other
http://images.travelpod.com/tw_slides/ta00/9d9/eca/kashan-traditional-house-kashan.jpg viewed October 2011

The courtyard is also used as a safe and private space by the female residents for communication with female neighbours. Likewise, some customs such as wedding and birthday celebrations or funeral customs and “Rohozi” (traditional performance art which is held on the pool surface temporarily covered by wood to form a platform) are held in the courtyard. In Kerman, the courtyard can be viewed as a multi-functional space that is the heart of traditional houses. It can be seen as an environmentally appropriate element which functions as a social-cultural and commercial space at the scale of urbanism and as the main space for conducting daily and family activities at the scale of individual buildings.

b. Dome

The dome can be considered as an element which makes a visual relationship between the different components of the city of Kerman. The use of domes as the roof of bazaars, commercial and spiritual buildings, water storage structures, and traditional ice boxes called “Yakhchal”, points out the compatibility of the dome with a variety of functions and spaces. Many researchers such as Brill (1974) and Herdage (1990) have described the dome as one of the main symbolic characteristic structures used in Islamic cities. However, the use of this curved form by traditional architects arises from the essential characteristics of materials such as brick and stone when they have to form the roof covering. Brick is a material that can naturally resist compression forces and is weak against bending and shear forces. The curved profile of the dome contributes to reducing the shear and bending forces exerted on its elements. In Islamic architecture,

domes can be classified by the number of their layers. A traditional dome can have a single, two or three layers (Figure 2.16).



Figure 2.16: Left, single layer dome, middle, double layer dome, right, three layer dome
<http://lajourd.com/HTMLs/dome.htm> viewed October 2011

The spaces created between two or three layers can be considered as natural insulation to reduce the flow of energy between indoor and outdoor spaces through the roof. Moreover, because of the curved form of the dome, the height from floor to soffit is large and therefore vertical natural ventilation can be conducted. Since warm air is lighter and rises to the top and cooler air will replace it drawn in through the multiple openings around the spaces, hot air is removed from the top vents and a natural flow of air from the bottom up is established to provide comfort in hot seasons.

c. The Dome as an Islamic Symbol

Many researchers such as Brill (1974) discuss the mosque and its related elements, such as the minaret and dome, as the main symbolic forms for Islamic cities. Brill (1974:1) explains that the mosque forms the centre of social life for all Muslim communities throughout their history. Herdage (1990:21) points out that in Islamic societies, a mosque is not only a house of worship, but also a public building serving a multiplicity of uses. He (1990:21) describes the mosque as a gathering place for prayers five times a day, an Islamic college, a community centre with its present day Western associations, and an emergency shelter for travellers.

Although Muslim prayer may be performed anywhere, traditionally, praying together has been held in higher esteem and is obligatory for the Friday noon service which is usually accompanied by a speech from the religious leader called “Khutba”. Friday mosques are places which need to have larger spaces in comparison with other small mosques, to contain all the males in the city who attend at Friday noon to pray. In Is-

lamic cities, the Friday mosque has been made larger and higher than other buildings, influenced by its social and physical functions and spiritual value.

In most of the Iranian cities in which brick or mud are used as the dominant materials for construction, the Friday mosques are almost always covered by tiles of different colours to be distinctive among other buildings and places. In terms of its spiritual value, the “Iranian mosque, and in particular the Friday Mosque with its resplendent ceramic sheath of the paradisaical colours of blue, green and yellow, sought actually to evoke the image of the Muslim paradise, with the sapphire of its water, the emerald of its foliage and the gold of its fruits and vines” (Pereira, 1994:15).

In terms of its physical form and scale, particularly in desert areas, where Caravans travelled at night to avoid the hot temperature of the desert in the day, in comparison with other buildings and places in Islamic cities, Mosques have been made of a size such that their elements including domes, minarets (lit by fire) or entrances could be seen by Caravans for navigation. As a result, the size of the Friday mosque can be viewed as a social and physical factor or indicator to control the vertical development of most Islamic cities in Iran. Figure 2.17 shows a conceptual cross section of an Islamic city in which the Friday Mosque and its main elements, including the dome and minarets, are depicted as the vertical benchmarks of the city.

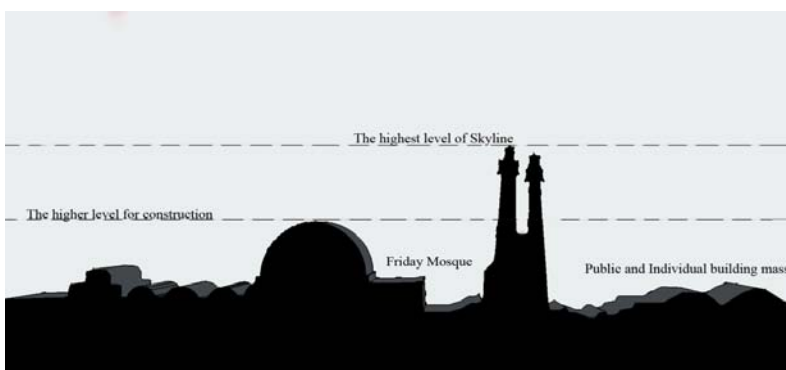


Figure 2.17: Conceptual cross section of an Iranian Islamic city

Figures 2.18 and 2.19 show the scale of the Friday Mosque, and how its decorative but also functional coverage by tiles and their colours makes a difference between this space and other urban spaces with ordinary functions.



Figure 2.18: Friday Mosque of Kerman, main entrance
<http://www.destinationiran.com/gallery/wp-content/uploads/2010/05/kerman-friday-mosque.jpg> viewed October 2011



Figure 2.19: Friday Mosque of Kerman, decorative coverage of walls
<http://cascolytravel.com/images/28122.jpg> viewed October 2011

2.3.6.4. Economy

Rizvi (1991:2) believes that Islam is a complete way of life. He (1991:2) argues that Islam is not only concerned with the spiritual uplifting of human beings, but is also equally concerned about their material and physical well-being. As a result, Islam guides its followers in financial and economic matters, in social and political affairs, and also in the moral and personal spheres of human life. In Islamic cities and societies, the economic system and its activities are influenced by religious economic laws such as “Khums”. “Khums” literally means “one-fifth or 20%”. In Islamic legal terminology, it means “one-fifth of certain items which a person acquires as wealth, and which must be paid as an Islamic tax”. The Qur'an mentions it in the following verse: “Know that whatever of a thing you acquire, a fifth of it is for Allah, for the Messenger, for the near relative, and the orphans, the needy, and the wayfarer...” (8:41).

Rizvi (1991:2) states that as Khums are an important pillar of the Islamic economic system, it is appropriate to briefly describe the system itself. However, it must always be remembered that the Islamic economic system is not in itself complete; it is a part of the over-all system of life. Islam is a compact system of life in which all its aspects (religious, ideological, social, political and ethical) are well synchronized. Muslims will succeed only if they make the whole system work, and not just pick and choose from it according to their likes and dislikes.

The Islamic economic framework and its related activities such as paying Khums can be viewed as a cultural-economic phenomenon that contributes to the horizontal development of a local economic system through more equal distribution of capital among the people of Muslim communities.

2.3.6.5. The Main Characteristics of Kerman's Architecture

The main characteristics of vernacular architecture in Kerman can be summarised as:

- a. Using local natural material and renewable energies (e.g. producing sun dried mud brick through the use of sunlight) with low ecological foot print.
- b. Using available technologies for construction at the scale of urbanism and architecture.
- c. Compatibility between architectural spaces and elements (in size, form, materials used and function) and cultural identity.
- d. Using open air areas (as multi-functional spaces) for cultural activities that contribute to being culturally sustainable.
- e. Protection of individual and social privacy by using a hierarchical structure to link spaces to each other at the scale of urbanism and architecture.
- f. Horizontal development of built up land rising from natural, cultural and economic factors.

Kerman city can be seen as an example of an organism in that its cultural structure has a mutual relationship with the surrounding environment (the basis of the strong model of sustainability) and its economic system (as the central factor of the strong sustainability model). Kerman reveals practical examples of the main cultural characteristics of sustainable architecture as determined by Torres and Sakamoto (2004). Each of its structural dimensions complements the others to achieve an environmentally and culturally appropriate and economically viable living. In Kerman, the combination of elements such as the bazaar (an economic symbol), the Friday mosque (a spiritual and social symbol), the Qanat (a technical symbol for the use of natural resources) and the overall environmental circumstances present a pattern for living.

Comparison between the main characteristics of Kerman's architecture and sustainable architecture (Torres and Sakamoto, 2004; Williams, 2007, and Steele, 2005) indicates this city has the potential to be approached as an example of an area for living sustaina-

bly. However, the sustainability of Kerman city still needs to be evaluated through use of a comprehensive framework and related indicators to give a true picture. This is an area for further research once such a framework has been developed.

2.4. Ecotourism and Its Architecture through Sustainable Development

Sustainability and ‘being sustainable’ can be viewed as the main factors that make a strong link between ecotourism and its related architecture. Sustainable ecotourism and sustainable architecture each attempt to respond to the societal needs of a given group of people or a society in an environmentally compatible, culturally appropriate and economically viable way. Arising from the literature presented above, ecotourism can be explained as a reaction to (and part of) mass tourism that aims to reduce tourism’s constant destruction of various parts of the world, specifically developing world countries. Since sustainability seeks to preserve the environmental, cultural and economic capitals and heritage for the present and next generations of humankind, both ecotourism and its related architecture aim to make a balance point between human needs, environmental conservation policies, cultural development principles and economic development strategies in a sustainable way.

The relationship between architecture and ecotourism is not yet defined and clarified. There are no direct works written on architecture’s relationship to ecotourism, even though some focus separately on both categories through discussion of sustainability. There are many examples of ecotourism resorts, or what are claimed to be ecotourism resorts, throughout the world. The truth is that true ecotourism resorts are very few and far between. Even though there are many destinations in the world that claim to have eco-friendly accommodation for ecotourists, there are still no criteria that define what architecture has to be for consideration as part of ecotourism.

2.5. Knowledge Gap and Research Justification

This section has summarised the literature on sustainability, ecotourism, and architecture and the dominant strategies and principles for their development. This summary suggests that a knowledge gap exists in terms of frameworks and strategies for sustain-

able development of ecotourism and its related architecture. This knowledge gap can be further described as a lack of a comprehensive framework that has the ability to integrally consider the ecological, cultural and economic influences exerted by ecotourism and its architecture on a given host destination. Furthermore, there is a deficient link between anticipated activities and each forecasted outcome and an absence of efficient cultural and economic indicators that can be used to evaluate ecotourism and architecture as being culturally and economically sustainable. This is discussed in more detail below.

2.5.1. Shortage of Integrated Strategies

2.5.1.1. Linkage between Anticipated Outcomes

The literature discussed above shows that the current strategies for sustainable development (for example NZTS 2015) aim to propose separately the main environmental, cultural and economic outcomes for sustainable development of tourism (and ecotourism as a segment of sustainable tourism). But there is no policy to make a logical link between these outcomes. Furthermore, influences that are exerted through achieving an outcome (for example an economic outcome) on the other areas such as cultural structure or the local economic system of the host destinations are almost ignored.

For instance, as discussed above, in NZTS 2015 there is a need to clarify how economic development in a host society through increasing the number of international visitors, as an economic priority for sustainable development of tourism, influences the environmental resources and cultural structure of that society. Likewise as another example, there is a need to clarify how the policy of production and consumption of local products (as cultural capitals) or restoration of cultural heritage of a host society (as sustainable social outcomes) can contribute to conservation of environmental resources and development of the local economy in a sustainable way.

2.5.1.2. Linkage between Forecasted Priorities

The priorities that are proposed to contribute to achieving the related outcomes must be ecologically, culturally and economically compatible with other priorities related to the same or other outcome(s). For example, in NZTS 2015, the relationship between ‘improving demand during the off-season by the tourism sector’ (proposed in Table 2.4) and ‘protecting and enhancing the environmental resources’ (proposed in Table 2.5)

must be clarified. This is because the second priority, for example, may cause an increase in the number of visitors that in turn increases the ecological footprint of tourism.

2.5.1.3. Linkage between the Indicators

Absence of efficient cultural and economic indicators is one of the main issues in the current strategies that exist for the sustainable development of tourism and its architecture. On the other hand, a comprehensive sustainable development strategy for tourism needs to use these indicators to evaluate and measure the cultural and economic as well as the ecological impacts of tourism on the host destinations. These impacts can be caused by the products, activities, and facilities proposed through tourism strategies.

Using environmental indicators such as ecological footprint can contribute to approving a phenomenon such as tourism as being environmentally compatible or not. However, reducing the ecological footprint of an activity or a product is not merely reliant on technical or ecological policy, but, can be considered as a social-ecological strategy. As evidence, Vale and Vale (2009) in their book, ‘Time to Eat the Dog?’, use the ecological footprint of each activity or product as an ecological indicator to show the environmental impacts of different patterns of resource consumption, activities and lifestyles. However, to reduce these physical impacts, they propose social-ecological policies that rely on changing the cultural behaviour in terms of maintenance, production and consumption of environmental resources. A sustainable tourism strategy should rely on the use of cultural and economic as well as ecological indicators for evaluation of the proposed activities or products (such as architecture) as being environmentally sensitive, culturally appropriate and economically viable.

2.5.1.4. Deficit of an Integrated Method to view Ecotourism and Architecture

As shown through the examples above (Nuristan villages and Kerman city), the main characteristics of an architecture that can be categorised into the three ecological, cultural and economic domains are linked together. As a result, each of the separate characteristics of ecotourism and architecture can be explored and identified through explanation of its links with the other characteristics. For instance the cultural characteristic of an ecotourism project or its proposed architecture can be conceptualised as influences that are exerted on the surrounding environment and local economic system through encouraging people to follow a particular social behaviour such as walking, cycling, or

using restored buildings as accommodation services (as cultural heritage). Exploring the linkage between the different characteristics of ecotourism and its products, such as architecture, needs to have a comprehensive system that can quantitatively evaluate and measure the effects of each characteristic on the others.

2.6. Research Question

This section determines seven sub research questions arising from the knowledge gap discussed above. These sub research questions are then integrated into the key research question in section 2.6.2.

2.6.1. Sub Research Questions

This thesis considers strong sustainability as the starting point, such that its strategies can form a framework for the sustainable development of ecotourism and its architecture. Through the following questions, the environmental, cultural and economic dimensions of this dominant strategy will be clarified. Sustainable strategies for development are also used to indicate the main outcomes for ecotourism and its architecture, and the relationships between these outcomes. The research questions also aim to investigate the main priorities and productive activities that contribute to achieving the forecasted outcomes, and the interaction between the outcomes and activities and measurement of the influences exerted by the proposed priorities on each other.

The sub research questions are:

2.6.1.1. What are the main characteristics of an efficient strategy for the sustainable development of ecotourism and its products, such as architecture?

2.6.1.2. What are the relationships between the anticipated outcomes for ecotourism and its architecture and how are they linked to each other?

2.6.1.3. What are the main priorities for the development of ecotourism and its related architecture that can contribute to achieving their forecasted outcomes in a sustainable way?

2.6.1.4. How do the priorities for the sustainable development of ecotourism and its products influence each other?

2.6.1.5. What are the main environmental, cultural and economic characteristics of the activities and products proposed for the sustainable development process of ecotourism?

2.6.1.6. How will these products and activities influence the environmental, cultural and economic profiles of the host destinations?

2.6.1.7. How can these influences can be evaluated and measured through the use of an integrated method?

The comprehensive framework for the sustainable development of ecotourism and its architecture are proposed in Chapter 4 and tested in Chapters 5 and 6, with the aim of answering the researches questions. The sub questions above are first answered in Chapters 4, 5 and 6 and in the conclusion (Chapter 7) before the research key question is answered.

2.6.2. Key Research Question

The seven sub research questions are summarised in the key research question (answered in Chapter 7) of this thesis:

What are the main characteristics of an architecture that can contribute to sustainable development through ecotourism?

This thesis intends to discover new knowledge about the integrated cultural, ecological and economic characteristics of ecotourism and its architecture. It can be considered as the first time research has proposed an integrated method that sets the ecological, cultural and economic characteristics of a phenomenon (such as ecotourism and architecture) in a holistic frame to measure their influences on each other through sustainable development.

2.7. Chapter 2: Summary

Chapter 2 explores the three areas of sustainability, ecotourism and architecture and aims to investigate the literature on these areas and their interactions with each other. It introduces sustainability as an umbrella that covers all human activities and products including ecotourism and architecture. Sustainability is viewed as a solution for problems such as uncontrolled population growth, degradation of environmental resources and unequal distribution of capital.

Chapter 2 introduces the weak and strong models of sustainability as two different strategies for development. As discussed, in the weak model of sustainability, environmental, social and economic capitals have equal value and can be substituted for each other. In the strong model of sustainability, environment and conservation of natural resources is considered fundamental for social and economic development. The chapter argues that the strong model of sustainability that has more potential than the weak model to solve humanity's issues.

The strong model of sustainability shows the main characteristics and goals of sustainability and sustainable development fall into the three categories of environmental, cultural and economic characteristics and goals. One of the main environmental goals for sustainable development is awareness of local and indigenous people about their environmental heritage and capitals through an educational process. Another environmental goal for sustainable development is engagement of educated people in an environmental conservation process.

Chapter 2 argues for the conservation of social - cultural heritage and capitals and development of cultural products and capitals as being the most important social goals for sustainable development. These goals can also be achieved through an educational process in which local and indigenous people are made aware of their cultural heritage and capitals and are engaged in the social development process. Sustainable economic development is determined as a social- ecological economic phenomenon that aims for equal distribution of capitals among all components of a given society in an environmental and social sustainable way. Through using the main characteristics of sustainability and its ecological, social and economic policies and strategies, ecotourism is defined as part of sustainable tourism with the same environmental, cultural and economic outcomes and goals as sustainability itself.

Ecotourism can be divided into the two types of hard and soft ecotourism. Since, hard ecotourism occurs in untouched areas with restrictive access, the soft ecotourism that occurs in rural and urban places and their adjacent areas has more opportunity for engaging people in the development process, and so is focused on in this thesis.

Two case studies of Thailand and Costa Rica are used to determine the influences exerted on these destinations by ecotourism development. Both show that the sustainable development of ecotourism can be a strategy to reduce environmental degradation, improve social wellbeing and develop local economic systems in a sustainable way.

The literature reviewed in this chapter indicates the dominant strategies for the sustainable development of architecture related to ecotourism must follow the same goals as the development of ecotourism. On the other hand, as ecotourism, its architecture must aim to conserve the environment and social cultural system of its host society. Likewise architecture must relate to development of the local economic system in an ecologically and socially compatible way.

Through assessment of strategies and indicators, such as NZTS 2015, ISEW, GPI, EF and GDP, proposed for sustainable development of tourism, there is no holistic framework for the sustainable development of ecotourism and its architecture. This is the identified knowledge gap, leading to the key research question:

What are the main characteristics of an architecture that can contribute to sustainable development through ecotourism?

Chapter 3 outlines a quantitative methodology that can be used to answer the research questions.

Chapter 3: Research Methodology

3.1. Introduction

This chapter outlines a quantitative methodology that will be developed and tested in this thesis. In particular, this methodology will be used to answer the sub-research and key research questions. To achieve this goal, the research structure is planned to clarify the information gained from the literature review on the three areas of sustainability, ecotourism and its architecture and their interaction with each other, the knowledge gap, and the research questions. The structure also shows how these steps relate to the proposed comprehensive framework for ecotourism and its architecture (Chapter 4), testing the framework in the three case studies (Chapters 5 and 6), and the general conclusion, which include discussion of the research shortcomings and limitations (Chapter 7).

3.2. Research Structure

The research framework is shown in Figure 3.1 and summarised as follows:

The research begins with a **literature review** that introduces sustainability, ecotourism as a sustainable type of tourism, and sustainable architecture as one of ecotourism's products (Figure 3.1). The literature explains the main principles that dominate sustainability and how these might be used as objectives to make a framework for the development of ecotourism and its related architecture.

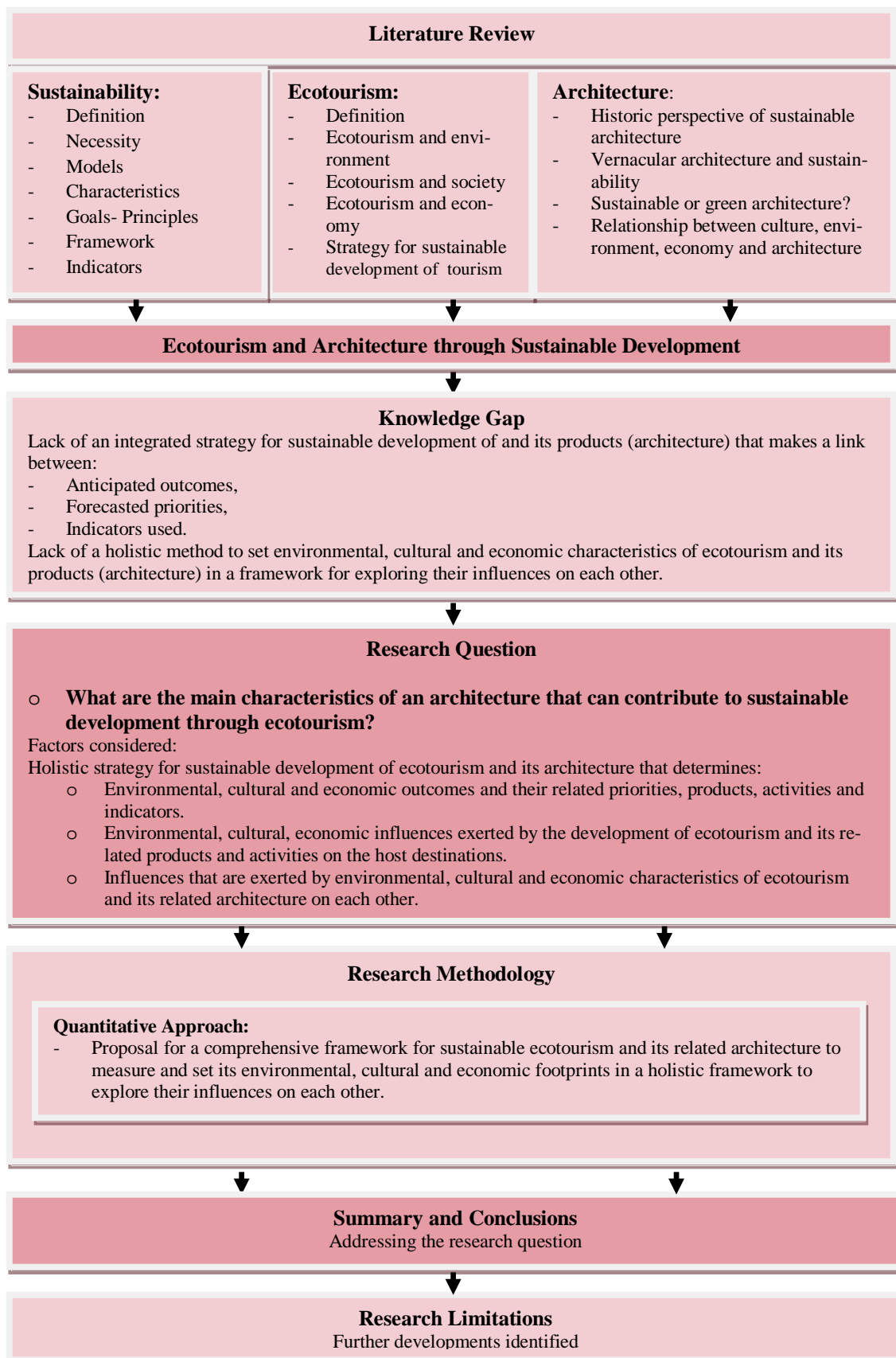


Figure 3.1: Thesis structure

The strategy for this work is to determine the main characteristics of ecotourism and architecture through determining their environmental, cultural and economic outcomes and related priorities, productive activities and indicators.

This research identifies the lack of a comprehensive strategy that has the ability to set all the environmental, cultural and economic characteristics of ecotourism and its related activities and products, such as architecture, in a holistic framework to evaluate these characteristics as being sustainable. This is the identified **knowledge gap** in this thesis. This gap is then expressed as a **research question**:

“What are the main characteristics of an architecture that can contribute to sustainable development through ecotourism?”

To answer the research question, a quantitative method is used. The quantitative approach involves evaluation and measurement of the environmental, cultural and economic footprints of ecotourism and its architecture and their interaction with each other. This is conducted through using the proposed comprehensive framework for sustainable development of ecotourism and its architecture. The quantitative method developed here has the ability to be combined with a qualitative approach in future research. This combination would allow researchers to measure how far apart the beliefs of people are about a given subject when compared with their acts. The results of this research are summarised and conclusions drawn, research limitations revealed, and aspects requiring further development are discussed.

3.3. Justification of the Research Methodology

The research methodology is intended to answer the primary research question about the main characteristics of an architecture that can contribute to sustainable development through ecotourism. The methodology requires a quantitative approach. This research is explorative is setting out to see if it is possible to design a method that links together assessment of the cultural/economic/environmental aspects of sustainability. It is also explorative in testing the method through using selected case studies and reflecting on the results of the investigation through a comparative approach. The proposed methodology is faced with ten problems explained in the next section that must be solved.

3.3.1. Methodological Problems

The problems that the quantitative methodology faces can be represented by the following questions:

3.3.1.1. What are the main elements of a comprehensive framework that comprises the environmental, cultural and economic characteristics of ecotourism and its architecture within an integrated approach?

3.3.1.2. What are the main environmental, cultural and economic outcomes for the sustainable development of ecotourism and its architecture?

3.3.1.3. What are the priorities for achieving the anticipated outcomes of the sustainable development of ecotourism and its architecture?

3.3.1.4. What indicators can be used to evaluate ecotourism and its architecture as being sustainable?

3.3.1.5. How can the environmental, cultural and economic influences of ecotourism and its products and activities (including architecture) on a given host destination be measured and evaluated?

3.3.1.6. How can the differences between the existing circumstances of an ecotourism project and its architecture and the goal of being sustainable be measured?

3.3.1.7. How can the ecological, cultural and economic indicators used for the evaluation of ecotourism and its architecture be linked to each other in a holistic method?

3.3.1.8. What data are required?

3.3.1.9. How can the required data be collected?

3.3.1.10. How can the collected data be analysed?

3.3.2. Research Case Studies

The three case studies of the Otago Central Rail Trail (OCRT) (regional scale), Naseby and Cromwell (site scale) have been chosen for evaluation through using the proposed framework, model and indicators. The main reasons for choosing these three case studies are explained in following sections.

3.3.2.1. OCRT

This section introduces the main characteristics of the OCRT as an appropriate case study for this thesis.

a. OCRT as a Community Based Soft Ecotourism

The OCRT is a community based soft ecotourism project that is managed and monitored by the OCRT trust. This characteristic gives the opportunity for local people to participate in its development. The OCRT and its community are linked to related organisations such as the Otago Regional Council and the Department of Conservation, which also have an interest in its sustainable development.

b. Rural and Urban Destinations along the OCRT

The OCRT makes a linkage between many rural and urban destinations and their adjacent areas. This characteristic contributes to its visitor experience of various host destinations with different environmental, cultural and economic particularities. Through using the OCRT as a case study, the proposed framework and model can be used to investigate how soft ecotourism influences its host societies and how far its cultural footprint is from an ideal sustainable model for ecotourism.

c. The OCRT as a Successful Tourism Project

The OCRT has been claimed as a successful tourism project by the New Zealand government (New Zealand Tourism strategy 2015, 2007:62). This makes it an ideal case study to explore the proposed framework, the model and the indicators in New Zealand as a developed country.

3.3.2.2. Second Case Study: Naseby

Naseby and Cromwell are two of the host destinations for OCRT visitors according to the OCRT trust, which describes them as attractive places for their visitors. In Naseby 6 of 26 accommodation buildings (excluding 72 camping sites) are refurbished buildings and 20 are new buildings. Conservation of the cultural heritage of Naseby in terms of its historical buildings used as accommodation services makes it distinctive in the ORCT.

In 2011, 4,350 of the total 11,788 OCRT visitors played curling at Naseby, making this activity another reason for using Naseby as one of the most important host destinations for OCRT visitors. The variety and frequency of other activities, products and services offered by Naseby accommodation services is another reason to choose it as a case study (see appendix 28).

3.3.2.3. Third Case Study: Cromwell

Unlike Naseby and as shown in Table 6.79 all accommodation services in Cromwell are newly constructed buildings. Comparison between the cultural footprints of Naseby and Cromwell related to their accommodation services through using the framework, the model and the indicators, will determine how using refurbished building as cultural heritage contributes to ecotourism and its architecture having a more sustainable cultural footprint.

As shown in Table 5.48, in 2011, 22.5% of all OCRT visitors came to old Cromwell town. Appendix 34 determines the variety of social and cultural products and activities offered by Cromwell's accommodation services to OCRT visitors. This is another reason to choose this host destination as a case study. Comparison between the cultural footprint (CF) of products and activities produced/ consumed and conducted by Naseby and Cromwell visitors will demonstrate how the framework, model and indicators can be used to compare two host destinations in terms of delivering sustainable tourism. Using the three case studies of the OCRT, Naseby and Cromwell to test the framework will also determine its strengths and limitations.

3.4. The Structure of the Methodology

Figure 3.2 shows the structure of the methodology used in this thesis included three main sections of: the comprehensive framework for ecotourism and its architecture; data collection and data analysing (Figure 3.2).

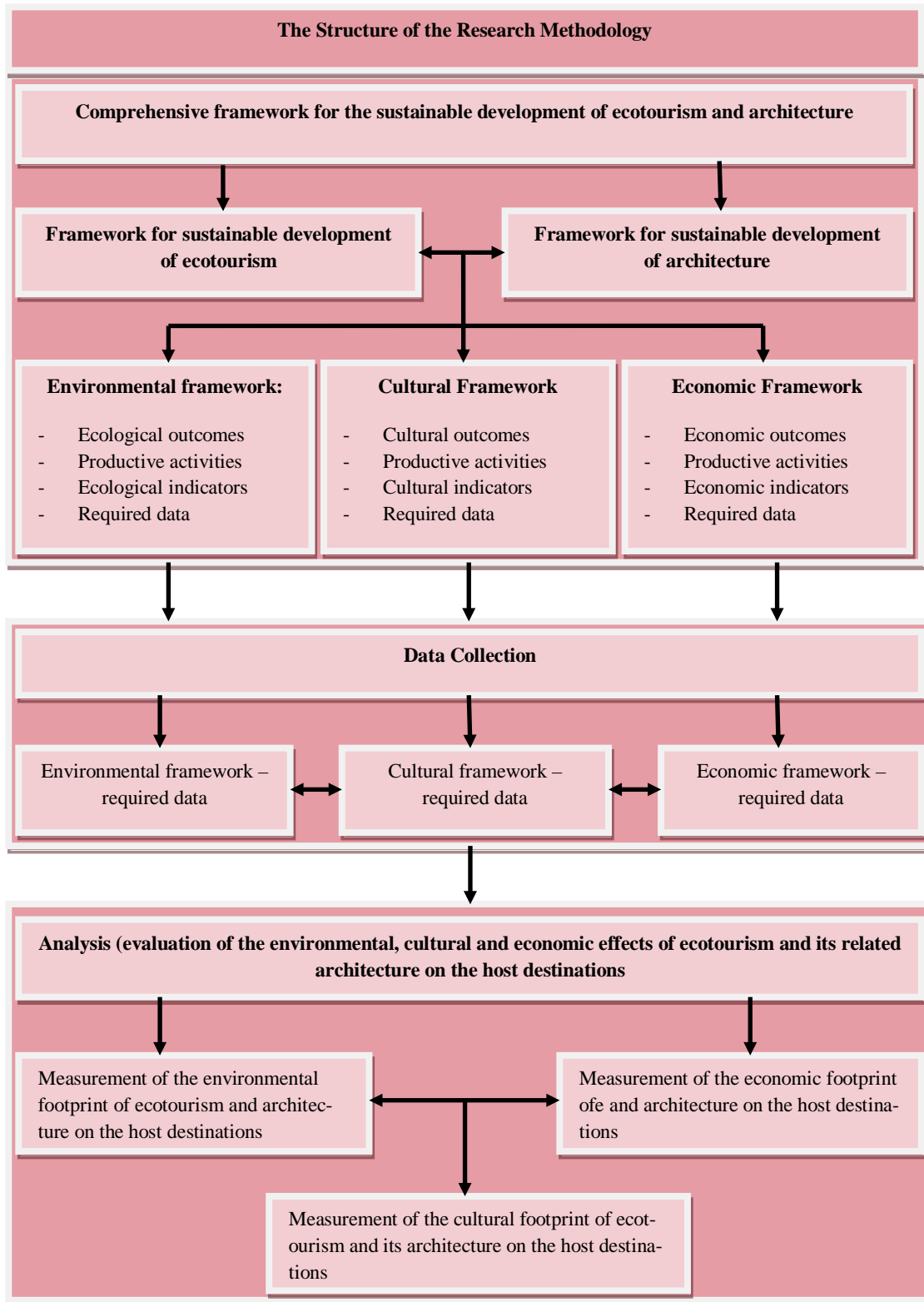


Figure 3.2: Research methodology structure

In this methodology, the comprehensive framework is the core of the methodology the influences the other sections of data collection and data analysis. The main sections of the methodology are explained below and the relationship between these sections determined.

3.4.1. A Comprehensive Framework for Sustainable Development of Ecotourism and its Architecture

The comprehensive framework proposed in this thesis is divided into two frameworks; the first for the sustainable development of ecotourism and the second for its architecture. One of the main aims of the proposed framework is answering the issues explained as methodological problems in section 3.3.1.

3.4.1.1. Framework for Sustainable Development of Ecotourism

As shown in Figure 3.2, the proposed framework for the sustainable development of ecotourism contains three subsectors: the environmental, cultural and economic frameworks. Each of these frameworks aims to determine the main outcomes for the sustainable development of ecotourism; productive activities that can contribute to achieving these outcomes; indicators that can be used to evaluate ecotourism products and activities as being sustainable; and the required data that can be used for this evaluation.

The following sections introduce the main components of the comprehensive framework for ecotourism.

a. Environmental Framework for Sustainable Development of Ecotourism

The environmental framework for ecotourism determines the main ecological outcomes for its development (such as conservation of environmental resources), the activities that can contribute to reducing the ecological impacts of ecotourism through its development, and environmental indicators (such as ecological footprint) that can be used to measure and monitor these impacts. In the framework and the model, the EF is the main environmental indicator used for evaluation of ecotourism and its architecture as being environmentally sustainable.

b. Cultural Framework for the Sustainable Development of Ecotourism

This thesis aims to present a theory-based cultural framework for the sustainable development of ecotourism that directs it and its products and activities in a way that makes it culturally appropriate and sustainable. This thesis attempts to conceptualise the main characteristics of a culture and its meaning through the use of an ecological perspective to make a link between the main social structure of the host societies of ecotourism and the surrounding environment. It can contribute anticipation of the cultural outcomes for ecotourism in a way that not only is compatible with the cultural system of the host societies, but is also harmonised with the surrounding environment. The cultural frame-

work proposes a range of cultural productive activities that aim to change and direct the socio-cultural behaviours of the host societies in a way that supports achievement of the anticipated outcomes for the sustainable development of ecotourism.

This thesis presents a new definition of the cultural footprint of an activity such as ecotourism, and, for the first time in this area of research, proposes a new method to calculate it quantitatively (Chapter 4). In this thesis, the cultural footprint of ecotourism is used as one of the main cultural indicators to evaluate it as being culturally sustainable. Likewise, this indicator is considered a main factor that can be used to explore the linkage between different environmental, social and economic characteristics of an activity or product through a sustainable strategy for its development.

c. Economic Framework for the Sustainable Development of Ecotourism

The economic framework for the sustainable development of ecotourism determines the main economic outcomes of this development process. However these anticipated outcomes (such as equal distribution of capitals among all participants who are engaged in the process) are not merely economic goals but can also be viewed as social outcomes. In addition, the economic framework for the sustainable development of ecotourism proposes productive activities (such as employment of local people through the process of development) which have both economic and social profiles.

The economic framework for the sustainable development of ecotourism introduces related economic indicators that can be used as tools to evaluate ecotourism development as being economically sustainable. Based on inability of efficient economic indicators and weakness of some methods (cited in Chapter 2) to offer such tools, this thesis proposes a new method to calculate the sustainable portion of GDP which is here called “GDPs” (see Chapter 4). This can then be used as an economic indicator for evaluation of activities and products such as ecotourism and architecture as being economically sustainable.

3.4.1.2. Framework for the Sustainable Development of Architecture

Figure 3.2 demonstrates a framework for the sustainable development of architecture related to ecotourism as a part of the comprehensive framework. This framework follows the same strategy and structure as the ecotourism framework. In this framework, the main anticipated environmental, cultural and economic outcomes for sustainable

development of architecture are similar to those forecasted for the development of ecotourism. However, the anticipated productive activities (for example using refurbished buildings as accommodation services) that must be conducted to achieve the outcomes contain the activities (such as having refurbished buildings as accommodation services) that are related to architecture.

The environmental and cultural indicators for the sustainable development of architecture rely on the quantity and quality of spaces, products, materials, facilities, and activities that are used by or offered to visitors through the use of architecture. Likewise, the economic indicators that are proposed for the sustainable development of architecture are similar to those used for the economic evaluation of ecotourism development, but in relation to architecture.

The framework for the sustainable development of architecture determines the data required in relation to each of the environmental, cultural and economic indicators. In a general view these data are raised from the quantity, quality and types of the spaces, facilities and products used by visitors; services and activities offered to visitors; and visitor data such as the number of users per year and average visitor nights.

3.4.2. Data Collection

Development of appropriate information systems was set as a priority in the New Zealand Tourism Strategy 2015 for the sustainable development of tourism. To test the effectiveness of this, in this thesis, the existing information systems used by the OCRT, New Zealand Statistics and related organisations, and research related to the OCRT are used as the basic sources for the required data. This strategy for data collection provides an opportunity to explore the strengths and the weakness of the information systems and, if necessary, propose guidelines for their development.

The data required by the proposed framework can be classified into three types. These are visitor data (such as the number of visitors and visitor nights); data related to facilities, services and products used (for instance types of transportation and accommodation services); and tourism activities data (for example the number of visitors who play golf or cycling). The following explains the methods used in this research to collect each type of data.

3.4.2.1. Visitor Data

The visitor data contains information such as: the numbers of visitors per year that visit each of the case study destinations; nationality of the visitors; and average visitor nights per year. These data are collected using Statistics New Zealand (tourism), official tourism statistics, and reports published by the Ministry of Tourism, Department of Conservation, regional councils, and related communities. These data are available through using the related web sites or contacting the related organisations or communities.

3.4.2.2. Data Related to Facilities, Services and Products

These data are collected through the use of official websites of related communities and organisations; official surveys related to the case studies; information published by tourism accommodation services as found in their websites; using websites such as Google Earth, Google Maps and Map Tool 2 (software that can measure distances and areas shown in Google maps and satellite maps - see <http://www.zonums.com>).

3.4.2.3. Tourism Activities Data

Data on tourism activities cover activities that visitors have done or that have been offered by the tourism sector over a year. These data are collected through the use of the official websites of the related tourism sectors and communities, and official surveys that have already been done for the selected case studies.

3.4.3. Data Analysis

The aim of the analysis is to explore the interaction between the ecological, cultural and economic characteristics of ecotourism and its related products and activities such as architecture through sustainable development. This analysis is conducted at two scales: regional and site scale.

3.4.3.1. Analysis at the Regional Scale

At the regional scale, this research analyses the ecological, economic and cultural influences of an ecotourism project, the New Zealand Otago Central Rail Trail (OCRT) in the host destination. This is conducted through calculation of the environmental, economic and cultural footprint of areas related to ecotourism including: transportation used; products (such as food and beverages); built up land (accommodation services); and tourism activities such as cycling, walking, golf and curling.

a. Ecological Analysis

This research analyses and evaluates the environmental impacts of the development of ecotourism in the host destination (at the regional scale) through the use of related indicators proposed in its environmental framework. To achieve this goal, this study calculates the ecological footprints (EFs) of:

- a. 1. The types of transportation used
- a. 2. The production and consumption of local and conventional foods
- a. 3. The refurbished and new buildings used as accommodation services by types of accommodation
- a. 4. Tourism activities

The calculated EF (the sum of the above EFs) is then compared with a target sustainable EF of holidays as the goal to be achieved through the sustainable development of the OCRT. The present EF is compared with the target EF to calculate the overshoot portion of the current EF (this process is explained in detail in Chapter 5, section 5.9.1). This portion of ecological footprint can then be used as an indicator to evaluate the development of ecotourism towards being environmentally sustainable.

b. Economic Analysis

The economic footprint of ecotourism in the host destination is calculated by using the economic indicators (such as employment and GDPs) as proposed in the economic frameworks for the sustainable development of ecotourism and its architecture.

b. 1. GDPs

In this analysis, GDPs (see Chapter 4) is considered a fundamental economic indicator that clarifies how much of the GDP earned through development of ecotourism must be spent to restore its environmental damages.

The total GDPs of an ecotourism project (OCRT) is calculated through measurement of:

- GDPs earned through transportation.
- GDPs earned through local products (food).
- GDPs earned through accommodation services.
- GDPs earned through tourism activities and related services.

b. 2. Employment

The number of staff employed in the OCRT is used as an economic indicator for the development of ecotourism and architecture.

c. Cultural Analysis

This thesis proposes a quantitative method to calculate the Cultural Footprint (CF) (defined in Chapter 4) of an activity or a product such as ecotourism or architecture that, in turn, can be used as a cultural indicator to evaluate its development as being culturally sustainable. This thesis uses the following steps to calculate the CF of ecotourism and its accommodation services at a regional scale:

c. 1. Quantities of Ecotourism Products and Activities

Calculation of the CF needs to use quantitative data including:

- The quantities of conventional and local products used such as foodstuffs (kg). It should be remembered that the quantities of local products (cultural products) are introduced as cultural indicators for the sustainable development of ecotourism in its related cultural framework.
- Calculation of the quantities of refurbished and new buildings used as accommodation services (m² or number of bed spaces). The measured factors include: areas of open and indoor spaces; number of bed spaces; volume of materials used; facilities used; and energy used, for example, all by types of accommodation services.
- Calculation of the number of visitors per tourism activity. Activities include: sports and recreational activities; visiting historical sites and buildings; and art activities (such as landscape photography). In this thesis, the activities mentioned are introduced as part of the socio-cultural behaviour of visitors and host people.

c. 2. The Reduced/ Increased Portion of EF

The portion of the EF of ecotourism and architecture which is reduced or increased is influenced by using cultural products, and is calculated through using two scenarios for the measurement of EF.

In the first scenario, the EF of the products used is calculated as the sum of:

- The EF of conventional products used (for example conventional foods), and that of cultural products used (for example local and organic foodstuffs).

- The EFs of the new and refurbished buildings (including open air spaces such as balconies and verandas) used as accommodation services.
- The result of this scenario (EF1) is the same as the result of the ecological analysis for products used (3.2.4.1-a).

In the second scenario, the ecological footprint of the products used (EF2) is calculated based on the assumption that:

- All the products used are conventional (such as conventional foods).
- All accommodation services are new buildings without open air spaces (verandas and balconies).

The difference between the results of these two scenarios (EF1-EF2) shows the reduced or increased portion of EF influenced by the use of:

- Local products (which are considered to be cultural products).
- Refurbished buildings and open air spaces.

c. 3. Increased / Reduced Portion of GDPs

This research calculates the increased and reduced portion of GDPs influenced by the use of local products and refurbished buildings as accommodation services using the two following scenarios:

- Measurement of GDPs based on $EF1 = (GDPs1)$
- Measurement of GDPs based on $EF2 = (GDPs2)$

Difference between $GDPs1$ and $GDPs2$ ($GDPs1-GDPs2$) is equivalent to the portion of GDPs that is reduced or increased by using local products, refurbished buildings as accommodation services, and using open air areas as parts of the related architecture.

c. 4. The CF of Local Products and Accommodation Services

The CF of using local products can be shown through using a triangular framework in which the quantity of cultural products used, the reduced/ increased portion of the EF of ecotourism, and the reduced/ increased portion of GDPs as influenced by the product(s), are set on each apex of the framework (Figure 3.3).

In Figure 3.3 the present CF of local products is shown as the area defined by Q 2, EF2 and GDPs2. In this figure Q 2 is the present quantity of product that contains Q 3 (the present quantity of conventional product) and Q 4 (the quantity of local products).

$$Q 2 = Q 3 + Q 4$$

In Figure 3.3, Q is the quantity of the Ideal model for sustainable living. In the Ideal model for sustainable living the EF of producing and consuming Q is the sustainable ecological foot print.

Shown in Figure 3.3, Q 1 is the quantity of products assumed as 100% conventional products.

EF 1 in Figure 3.3 presents the EF of consuming and producing 100% conventional products (Q 1).

Demonstrated in Figure 3.3, the EF2 is the present EF of producing Q 2 (including Q3 and Q 4). In addition in this figure, Ideal EF is the sustainable ecological footprint of products.

In Figure 3.3, the GDP is the total GDP related to products. In the Ideal model of sustainability, since the overshoot portion of the EF is zero, the total GDP= GDPs. Shown in Figure 3.3, GDPs1 is the sustainable portion of GDP when 100% of products are conventional. Moreover in this figure, GDPs2 is the present GDPs related to producing Q 2 that contains Q 3 and Q 4. As illustrated in Figure 3.3 the difference between EF 1 and EF2 shown as (R) EF 1 is the reduced portion of the EF 1 influenced by producing and consuming Q 4. Moreover comparison between the Ideal EF and other EFs (EF 1 and EF2) indicates the overshoot portion of each EF. Furthermore, in Figure 3.3, the difference between GDPs1 and GDPs2 shown as (I) GDPs1 indicates increased portion of total GDPs influenced by producing Q 3.

The model illustrated in Figure 3.3 has the ability to show the present CF of the products, also it can be used to determine how much of the total GDP must be spent to change the present EF of the products to fit with its ideal ecological footprint. Figure 3.3 illustrates a model that can be used to show the CF area of other cultural products and activities. Also this model can be used to compare the CFs of different activities or products with each other at the different scales of the region, community, site and build-

ing. In addition, this model can be used as a tool for planning, management and mentoring of the process of development as being sustainable.

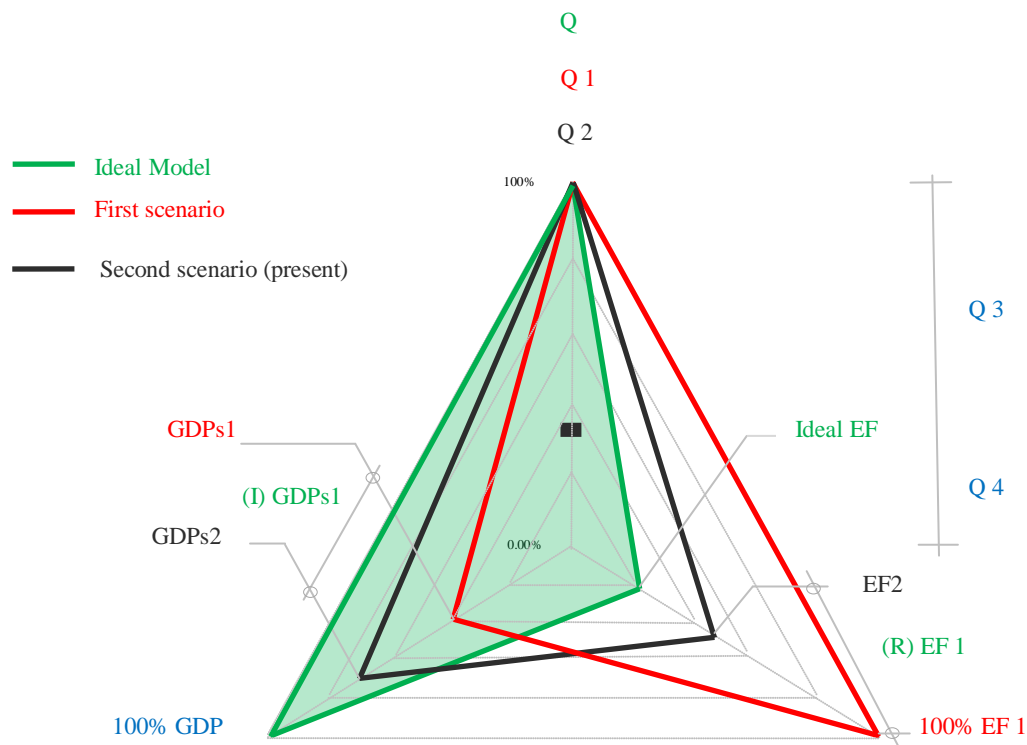


Figure 3.3: A sample model to show the CF of local products

d. Calculation of the CF of Tourism Activities

The CF of tourism activities is done through the following steps:

- d. 1. Calculation of the number of visitors for each activity.
- d. 2. Calculation of the EF of each visitor's activities.
- d. 3. Calculation of the GDPs per visitor for each activity.

The results determine the environmental and economic footprints of each tourism activity which is considered to be a part of visitors' cultural behaviour that are contributing through ecotourism to development. Setting these results in a common framework shows a part of the CF of ecotourism in the host destination. This study makes a comparison between the numbers of visitors, EF and GDPs of each type of tourism activities (such as walking, golfing and curling) through setting them in the holistic framework mentioned. At the regional scale, it allows this research to explore which types of tourism activities (as proposed cultural behaviours) are more culturally appropriate, envi-

ronmentally sensitive, and economically viable. The CF of these activities is considered a part of the total CF of ecotourism development.

e. Total CF

The total CF of ecotourism development determines the influences exerted by the total cultural products and activities on the EF and GDPs of ecotourism. In Figure 3.3, quantities of all cultural products and activities (QCPA) can be set on the top apex of the Figure. Also the reduced/increased portions of GDPs and EF can be set on the left and right bottom vertices of the model.

3.4.3.2. Analysis at the Site/Individual Building Scale

At the site/individual building scale, this thesis analyses the ecological, cultural and economic footprint of ecotourism and its related architecture (as used as accommodation services in the OCRT) in the host destinations through the use of Naseby and Cromwell as second and third case studies. Both these case studies are settlements located along and influenced by the OCRT. The factors for which their footprints are analysed include: transportation used; products (such as food and beverages); built up land (accommodation services); and tourism activities and services such as cycling, walking, golf and curling. The analysis at the site/architecture scale for Naseby and Cromwell follows the same method explained above for the regional scale of the OCRT.

This thesis makes a comparison between the results of the analysis for Naseby and Cromwell to find how an ecotourism project can exert different ecological, cultural and economic influences on these two areas. These belong to different bioregions, with different cultural heritages, capitals and behaviours, but that are linked together through a community based ecotourism project.

The comparison between the environmental, cultural and economic characteristics of the accommodation services used allows this thesis to test the proposed holistic frameworks for ecotourism and architecture, which are here used to determine the ecological, cultural and economic characteristics of an architecture that contributes to sustainable development through ecotourism.

3.5. Importance and Limitations

This section discusses the strengths and weaknesses of the proposed methodology.

3.5.1. Importance of the Methodology

3.5.1.1. Comprehensive Approach

The methodology aims at a comprehensive approach to the sustainable development of ecotourism and its architecture. For a first time this thesis presents an original methodology that can make a linkage between the surrounding environment, culture and economic system in a given host destination for ecotourism (and its architecture) in order to measure its level of sustainability. This also relies on the comprehensive framework included as the main part of this methodology. The comprehensive framework, its importance and limitations will be discussed in detail in the next chapter (Chapter 4).

3.5.1.2. The Integration of Environmental, Social and Economic Indicators

Integration of ecological, social and economic indicators in a quantitative method makes an opportunity for this thesis to explore the environmental, social-cultural and economic influences exerted by ecotourism and its architecture on a given host society. Likewise this relies on using the proposed holistic framework and model.

3.5.1.3. Compatibility with Quantitative Methodologies

The quantitative methodology can be used as complementary method to any qualitative methodology for assessment of the sustainable development of ecotourism and its architecture.

3.5.1.4. Using Existing Information Systems and Available Technologies

This methodology uses existing information systems, and available research results to show how these can be used for this research. The reason for doing this is to explore the limitations of the existing information systems, data and available research. The study was made without site visits; so as to ascertain if it were possible to draw meaningful conclusions from publicly- available data. If this could be shown to be the case it would increase the value of the methodology, as it would be able carried out remotely, and at lower cost, increasing its applicability.

3.5.1.5. Indicating Required Data through Related Indicators

The methodology indicates the required data needed from the proposed environmental, cultural and economic indicators. This allows determination of the data linked to the sustainable development of ecotourism and its architecture, thus avoiding collecting irrelevant data.

3.5.1.6. Integrated Analysis

The methodology proposes an method in which the ecological, social and economic data are analysed in a way that indicates the interaction between them. It allows the thesis to cover all dimensions of sustainability related to the development of ecotourism and its related products and activities.

3.5.2. Limitations

3.5.2.1. Shortcoming of Available Information Systems

One of the main problems of the approach is relying on other peoples' data and results, with no means of checking their accuracy. However, development of the method and testing it will be done by attempting to collect data from the same type of sources, in this case information published on official OCRT accommodation websites, and research in the public domain related to the OCRT.

3.5.2.2. Accuracy

Since the methodology relies on using existing information systems with their shortcomings, the quantitative results cannot be completely accurate, although comparisons between results produced by the research will still be relevant. However the intention of thesis is not to come out with accurate results but rather to make people aware of the problem and hence improve data collection for more accurate results.

3.6. Chapter 3: Summary

This chapter describes the quantitative methodology used in this thesis for answering the research questions in Chapter 2. From the literature review, the three areas of sustainability, ecotourism and architecture and their relationship with each emerged as the point of focus for the research. Sustainability and its policies and principles are the factors that link ecotourism and its architecture to each other as being sustainable. This the-

sis aims to propose a methodological framework for sustainable development of both ecotourism and architecture.

The comprehensive framework for ecotourism and its architecture needs to be able to:

- Comprise all environmental, social and economic characteristics of ecotourism and its architecture such that these dimensions can be linked to each other.
- Measure the ecological, cultural and economic influences exerted by ecotourism and its architecture on a given host society.
- Use efficient indicators for evaluation of ecotourism and its architecture through a holistic approach to sustainable development.
- Be used as a comprehensive tool for evaluating of ecotourism and its architecture through whole process of sustainable development.

Figure 3. 1. shows the research structure. The research is explorative and aims to design a method that links together assessment of the environmental/ cultural/ economic aspects of ecotourism and its architecture through sustainability. The method will be tested on selected case studies through taking a comparative approach.

Problems with this process are lack of first hand data will mean relying on secondary data sources. However, this is also an opportunity to test such sources and make recommendations about data collection improvements.

In this thesis the EF is the main ecological indicator for evaluation of ecotourism and architecture. To solve shortcomings identified with this indicator earlier, the thesis proposes a comparative method to use the EF and other indicators for evaluation of ecotourism and its products and activities as being sustainable. As shown in Figure 3.2, the comprehensive framework uses the quantity of the social products and activities (for example the quantity of food consumed by visitors, or the number of visitors who play golf) (also see Chapter 4). These quantities are then converted to EFs. GDPs forms the main ecological-social economic indicator for evaluation of ecotourism and its architecture as being economically sustainable.

The methodology proposes an original method for analysing the data related to each of the environmental, social and economic indicators through use of an holistic model that is called the Cultural Footprint model (CF model) (Figure 3.3). Using this model allows

exploration of the ecological, social and economic influences exerted by development of ecotourism and its architecture on a given host society. Furthermore the CF model has the ability to be used as a tool to compare the ecological, social and economic influences of ecotourism and its products and activities on different host destinations.

One of the strengths of the methodology is its comprehensive approach to the sustainable development of ecotourism and its architecture. Using the CF model allows the thesis to analyse the ecological, social and economic footprint of ecotourism and its architecture in relation to each other through a holistic approach to sustainable development. The main limitation of the methodology is having to rely on existing information systems which will affect the accuracy of the results. However, using the comparative methodology will help to reduce the negative impacts of this shortcoming on the results.

As discussed above proposing the comprehensive framework is one key goal of this thesis. Chapter 4 introduces the framework in detail.

Chapter 4: Comprehensive Framework for the Sustainable Development of Ecotourism and Its Related Architecture

This Chapter presents a comprehensive framework for assessing the sustainable development of ecotourism and its related products and activities. This framework is divided into two segments. The first segment contains a holistic framework for the sustainable development of ecotourism and the second section introduces a multi-dimensional framework for the sustainable development of architecture through ecotourism.

Each of the frameworks contains three subsectors, these being the cultural, environmental and economic frameworks. Each of the three is further considered in terms of their related outcomes; productive activities; and indicators and required data. This thesis attempts to conceptualise the results of these holistic frameworks as a simplified cultural footprint model (CF-model). This model has the ability to put all ecological, cultural and economic characteristics of an activity, such as ecotourism, or a product, such as architecture, in a holistic framework so that its sustainability can be evaluated.

Moreover to construct the CF-model, this chapter proposes a new method to measure the sustainable portion of GDP (GDPs) to be used as an economic indicator for sustainability that has ecological and social characteristics.

4.1. A Framework for Assessing the Sustainable Development of Ecotourism

4.1.1. Ecological Framework for the Sustainable Development of Ecotourism

This study presents a social-ecological framework that portrays the main ecological goals which can be used as a pivotal part of an integrated set of principles for the sustainable development of ecotourism. In addition, ecological indicators and their required data are presented as the main output of this part of the thesis, in order to evaluate the compatibility of ecotourism products, services and activities with the environment.

4.1.1.1. Environment and Framework for Development of Ecotourism

Any discussion of the sustainable development of ecotourism and its framework should reference its environmental impacts because, according to the definition of sustainability as a multi-dimensional phenomenon, these form a significant part of a framework for sustainability through development of ecotourism. In this view, as explained by Pigram (1980:557):

[The] environment is not just a constraint, it is a resource; it is not just a problem, it is an opportunity. That mankind has advanced as far as he has is as much due to the abundance of the natural environment as to his own skills in exploiting those resources. Properly safeguarded, the environment can continue to nurture his economic, social and cultural progress. The need therefore is to understand the characteristics of the environment within which development is to take place and the extent to which it can be manipulated to serve mankind's needs.

Anticipation of what an ecological framework for ecotourism development might be is related to the different approaches to mainstream thinking about sustainable development. Weaver and Lawton (1999:12) introduce a set of moderate operating principles for 'mainstream' sustainable development shown in Table 4.1.

Table 4.1: Operating principles for 'mainstream' sustainable development.

Operating principle (Weaver and Lawton 1999:12, Modified from Murphy, 1994).	Category
Establishing ecological limits and more equitable standards of consumption	Ecological
Redistribution of economic activity and re-allocation of resources to fulfill principles of equity	Economic
Control of human population level	Socio-cultural
Preservation of basic resources that support the earth's essential support systems	Ecological
More equitable access to resources and increased technological effort to use them more effectively	Ecological
Attention to carrying capacity and sustainable yield	Ecological
Retention of renewable resources	Ecological
Maintenance of biodiversity and cultural diversity	Socio-cultural
Minimization of adverse impacts on air, water and other natural elements	Ecological
Local community control	Social
Planning and policy at a broad national and international level	Political
Economic viability	Economic
Maintenance of environmental quality	Ecological
Environmental auditing as a dominant monitoring procedure	Ecological

The proposed operating principles (Table 4.1) entail a combination of ideologies presented by resource conservationists and resource preservationists. In this approach the ‘resource conservationists’ address those who are supportive of economic growth, but only under conditions which do not threaten the natural resource base. Likewise the ‘resource preservationists’ address those who are supportive of ecosystem integrity, but do not advocate a drastic de-population of the earth, or radical reduction in material lifestyle.

Table 4.1 shows a composite framework for sustainable development in which the components are interwoven with each other. This study sorts these operating principles into the four categories of ecological, economic, socio-cultural and political principles (Table 4.1-right column). Even for “mainstream” sustainable development, as shown in Table 4.1, ecological principles play a crucial role in achieving the forecasted outcomes for sustainable development.

4.1.1.2. Ecological Framework and Environmental Awareness

Environmental conservation should not be considered as a merely technological or economic activity; rather it should be viewed as a social-ecological phenomenon. May (1991:118) argues that if tourism is to play a conservative role in the maintenance and enhancement of the environment in the developing world, where many of the worst excesses of the so-called developed world have not yet been seen, it needs to consider the values which developers, host communities and visitors alike place on the environment. He (1991:118) introduces the idea of having a “better understanding of the values attached to people’s environments” as the first step to bringing humanity closer to the goal of sustainability. Thus, awareness about environmental and natural values, and efficient strategies to conserve the natural heritage and its economic and social impacts on the host destinations could be pivotal parts of an ecological framework for the sustainable development of tourism.

Environmental awareness, as one of the main social-ecological outcomes for the sustainable development of tourism, can be conducted through an educational process which makes host communities, local and indigenous people, stakeholders and developers ready to be engaged in the environmental conservation process. Furthermore, this environmental awareness plays an important role to “move visitor experiences beyond

passive enjoyment to an active role that promotes positive environmental ethics and fosters preferred behavior” (Fallon and Kriwoken, 2003: 289).

4.1.1.3. Social-Ecological Goals for Ecotourism Development

As Murphy (1983:181) points out, all planning (including planning for the sustainable development of tourism) needs goals to supply a frame of reference for detailed physical planning and for the constant management decisions that follow. He (1983:183) argues that these goals are abstract and continuous concepts intended to prepare a general direction rather than specific guidelines, but that they must have general support and be feasible to be effective.

This study views the environmental impacts of ecotourism development on the host destinations as a social-ecological issue caused by an unsustainable pattern of resource consumption, lack of social and cultural sensitivity to natural heritage, and lack of environmental awareness, plus expansion of the ecological footprint (EF) of tourism activities, products and services through the development process.

Table 4.2 shows the anticipated ecological outcomes which can be achieved from the sustainable development of ecotourism. By introducing these goals, this thesis attempts to progress the attitude of the tourism industry towards the environment from one of being merely economically exploitative to one of stewardship. The latter is something required for natural and environmental conservation.

Environmental awareness together with engagement of local and indigenous people in the natural conservation process are considered goals which can be achieved through a community approach to tourism development. In this view, these two prime goals play a pivotal role as the basic principles for the realization of the other forecasted ecological outcomes (Table 4.2). Furthermore, in this approach, education as potentially a main tourism activity can be explained as a transversal domain which has a close and effective relationship with all the other ecotourism activities shown in Table 4.2.

Ecological outcomes	Productive activities
Environmental awareness	Engagement of local and indigenous people as well as all related organizations (individuals, governmental and NGOs) in environmental education.
Engagement of local and indigenous people in the conservation process.	Employment of local and indigenous participants in the development process as employed or volunteer staff.
Attention to carrying capacity and sustainable yields	Making a balance between carrying capacity, resource consumption and the ecological footprint of tourism activities, products and services.
Protection of environmental resources and maintenance of biodiversity	Using policies to reduce the ecological footprint of tourism activities, products and services
Contribution through using renewable resources to generate energy used by tourism products and services.	Enhancing use of green technologies based on renewable resource consumption and decreasing demands for fossil fuels to generate consumed energy.

4.1.1.4. Definition of an Indicator

An indicator “can be an objective measurement, such as a number, a specific rate or ratio; it can however, also refer to an opinion, or to a perception that points to a specific condition or situation, and can be used to measure changes in that condition or situation over time” (Secretariat of the Pacific Community -SPC, 2010:1). In other words these pointers can be used to look closely at the resultant outcomes of initiatives and actions or interventions. In addition, indicators provide the benchmarks needed to monitor and measure promotion of a particular goal. The first section introduces the ecological, cultural and economic indicators used in this thesis for evaluation of ecotourism and its architecture, and the following, the proposed ecological indicators for sustainable development of ecotourism.

a. Ecological Indicators

“Ecological indicators are mainly used to assess the condition of the environment, as early-warning signals of ecological problems, and as barometers for trends in ecological resources” (Niemi and MacDonald, 2004: 89). Esther et al (2005:218) consider ecological indicators necessary for evaluating the effect of human activity on nature and the environment. As Christian et al (1996:89) reveal, most sets of ecological indicators proposed so far have focused on the state of the environment rather than on the interaction between society and ecosystems. Current environmental issues are caused not only by using technologies dependent on fossil fuels but also by social-cultural patterns of consumption of environmental resources. As a result, the solutions for these problems must be considered as social cultural policies. Thus, ecological indicators can be introduced

as phenomena arising from socio-ecological principles. According to Christian et al (1996:89), the principles that form the basis of the socio-ecological indicators, focus on the societal activities and interactions between nature and society through the use of materials and energies.

a. 1. The EF

One of main aims of this thesis is to explore the current environmental impacts of tourism and propose guidelines for reducing these impacts. As discussed in Chapter 3, due to its strengths, the EF is used as a basic ecological indicator to evaluate ecotourism and its architecture as being environmentally sustainable.

The EF was used in master's study (O'Connor, 2009) to assess the impact of international tourists in New Zealand. The EFs were calculated of five categories of activities and services undertaken by international visitors to New Zealand: food; accommodation; transport; and goods, using the 2003 version 3,2 calculator (O'Connor, 2009:103).

According to O'Connor (2009:103) a survey was conducted in September 2008, from which 236 responses were received, resulting in a 33% response rate. O'Connor (2009:92) calculates the EF of New Zealand international tourists as 8.26 gha/capita, which is 2.36 gha/capita more than the EF of a New Zealand resident (5.9 gha). She argues that the EF for tourists still sits at 55% of New Zealand biocapacity.

O'Connor (2009:104) points out that the main tourist energy consumption is for transport, goods and purchases, and activities and attractions. She (2009:104) argues that cropland, as the second largest land area of the EF, contributed to food having the largest overall land area in the tourist EF.

O'Connor (2009) suggests lack of information; financial issues and time for research are the main limitations for calculating the EF of New Zealand tourists. She also determines approximation of the results arising from shortcomings in available information as another limitation of her research. This parallels discussions of the limitations of the EF in Chapter 3 Both studies indicate development of information systems as one of the necessities for sustainable development of tourism.

Table 4.3 determines the proposed social-ecological indicators for evaluating the environmental impacts of ecotourism development on the host destinations and achieving the ecological goals of ecotourism shown in Table 4.2. Indicators ‘1a’ and ‘1b’ (Table 4.3), which indicate the number of participants in environmental education and the conservation process are also introduced as social cultural indicators. These indicators can also be viewed as complementary indicators to the EF to evaluate the success of the social dimension of environmental conservation principles.

Ecological outcome	Indicator	Definition
Environmental awareness	1a	The number of local people who participate in the educational process
Engagement of local and indigenous people in the conservation process.	1b	The number of people who engage in the environmental conservation process including volunteer or employed participants
Attention to carrying capacity and sustainable yield	1e	Ecological footprint of tourism activities, products and services
Protection of environmental resources and maintenance of biodiversity	1e	Ecological footprint of tourism activities, products and services
Contribution through use of renewable resources to generate energy used by tourism products and services.	1e	Ecological footprint of tourism activities, products and services

4.1.1.5. EF by Types of Ecotourism Products and Activities

This thesis attempts to calculate the pressure on natural resources exerted by visitors in their host destinations. As mentioned above, the EF is used as an indicator to evaluate tourism activities, products and services as being environmentally compatible. As a first attempt to achieve this goal, the EF of a visitor is divided into the three categories of; food consumption, accommodation services (as the most important additional infrastructural factor related to tourism expansion) and transportation (Table 4.4).

Mahравan and Vale (2010) calculated the ecological footprint of food, transportation, consumed water and accommodation services for the Otago Central Rail Trail (OCRT) visitors in 2009. Their study (2010:1393) shows that the total OCRT- EF is equivalent to 7,281gha, and the consumed water EF is equivalent to 116 gha, or just 1.6% of the total EF for OCRT visitors in 2009. This earlier study (2010:1393) shows that in comparison with food EF (2,570 gha), transportation EF (4,356 gha) and accommodation EF (239 gha), the consumed water EF is so small that, to simplify the list of ecological in-

dicators used in this thesis, it can be ignored. In addition, as O'Connor (2009) reveals, the EF of waste related to New Zealand tourism accounts for 5% of the total EF of New Zealand international tourism. Consequently, this thesis focuses on the four categories of transportation, food, accommodation and tourism activities and ignores other factors with small EFs.

Table 4.4: Tourist EF and its sub-categories

Category	Sub-categories
Visitors' ecological footprint	Transportation EF
	Food EF
	Accommodation services EF
	Visitor activities

4.1.1.6. Required Data

Since the EF of tourism products and activity is calculated yearly, the required data must relate to a year, which is the baseline year of the EF. Table 4.5 shows the required data related to each EF category. This thesis aims to use the data related to 2011 to calculate the EF of tourism in the three case studies. Since some of the required data related to 2011 are not available, data related to the previous years are used to calculate the EF and where this happens will be addressed throughout the thesis.

As shown in Table 4.5, the data required to measure the EF of the transportation used by visitors are divided into two categories: required data related to transportation used by international visitors and data related to travel by domestic tourists. The differences between these two sets of data can be explained as the differences between the types of transportation used and their different EFs and the total tourism-km travelled (international visitors travel a lot further).

In this thesis, visitors travelling along the Otago Rail Trail, whether by foot or on bicycles are viewed as participating in visitor activities and EF is separately calculated separately. Thus to avoid double counting in the EF of visitors activities related to travelling, in Table 4.5 transportation used while in Otago is excluded. In Table 4.5, transportation comprises the types of transportation used to access the OCRT.

In Table 4.5 it is assumed both international and domestic visitors effectively eat the same amount of food and use the same types of accommodation services in a host desti-

nation. Thus, as shown in Table 4.5, to calculate the EFs of food and accommodation services consumed and used by visitors, the total number of visitors (international and domestic) is used. Likewise, some data such as ecological carrying capacity and visitor nights are common between all relevant EF categories.

EF Category	Required Data	
Transportation	International Transportation	Number of international visitors by home place
		Total number of international visitors
		Distance between international visitor home places and host destination by types of transportation used
		Total international tourism- km
		International T-km by types of transportation used
		Energy use MJ/ Passenger-km by types of transportation used
		Total Energy use MJ
		Ecological Carrying Capacity
		Domestic Transportation ¹
	Domestic tourism- km by type of transportation used	
	Energy use MJ/ (domestic) Passenger-km by types of transportation used	
	Total Energy use MJ (for domestic visitors)	
	Food	Number of visitors
Average number of nights visitors stay during their visit		
Food eaten out per visitor		
Energy use MJ per kg food		
Total energy use (for food consumed by visitors)		
Ecological carrying capacity		
Accommodation	Average number of visitor nights by types of accommodation used	
	Number of visitors	
	Total visitor nights by types of accommodation used	
	Energy use per visitor night by types of accommodation used	
	Total energy use by types of accommodation used	
	Ecological carrying capacity ²	
<p>1. Domestic transportation comprises the access to the OCRT and travelling along the OCRT is excluded.</p> <p>2. Ecological carrying capacity is used to calculate the EF of the products (e.g. accommodation services) and activities (e.g. walking and golfing) through following equation: $EF = \text{Total lifecycle energy use} / \text{Ecological carrying capacity}.$</p>		

4.1.1.7. Discussion

This section considers the process of environmental conservation through the development of sustainable ecotourism as a social-ecological process based on a community approach to tourism. Forecasted ecological outcomes for the sustainable development of tourism tend to engage local and indigenous participants (who achieve environmental awareness through taking part in an educational process) in the environmental conservation procedure. Likewise, reducing the negative impacts of ecotourism on natural resources, which can be achieved by decreasing the EF of ecotourism products, services

and activities, forms a crucial part of the anticipated ecological goals for tourism in this study.

The three categories of transportation, food and accommodation are introduced as the important representative products and services of ecotourism because they have the highest energy use and the biggest EF. Consequently, in this thesis, the EFs of these three categories are used as ecological indicators to evaluate the environmental compatibility of ecotourism development in the host destinations. This study, therefore, also presents a list of the required data which can be used to measure two things:

- a. The level of environmental awareness among local and indigenous people and the number of participants in environmental conservation through tourism development.
- b. The ecological footprint of tourism's products, services and activities.

This ecological framework, related indicators and required data are viewed as a sub-sector of an integrated framework for the sustainability of ecotourism development.

4.1.2. Cultural Framework for the Sustainable Development of Ecotourism

To attempt to achieve sustainability through the development of ecotourism needs constant monitoring and this could be done through the evaluation of the cultural footprint of tourism as well as its ecological and economic impacts on the host destinations. This study attempts to introduce an efficient cultural framework for this, together with its related indicators and required data. This can then be used to evaluate the CF of ecotourism through sustainable development in a host destination.

This study introduces a theoretical base for the creation of a cultural framework which includes definition of pivotal factors (such as culture, development, and cultural dimension of development) that play important roles in structuring a cultural framework. To support the latter theory, this study presents some examples of existing frameworks for cultural statistics, and cultural frameworks for sustainable tourism. One of the main outcomes of this study will be a cultural framework for ecotourism and development of sufficient cultural indicators with their required data. These can then be used as a tool for evaluating the CF of ecotourism in the host destinations. This cultural framework is considered as complementary to the ecological and economic frameworks to create an overall comprehensive framework which has the ability to evaluate sustainability through development of ecotourism.

4.1.2.1. Culture

As defined by The Mexico Declaration on Cultural Policies in 1982, “culture is the whole of distinctive traits – spiritual and material, intellectual and affective characterizing a society or a social group” (Breis, 1992:2). It is the sum total of the ways through which a group builds up a pattern for living that is transmitted from one generation to another. Cochrane (2006:322) argues that culture consists of patterns, explicit and implicit, of and for behavior acquired and passed on by symbols, constituting the distinctive achievement of human groups, including their embodiments in artifacts. The essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values; cultural systems may, on the one hand, be considered as products of action, and on the other as conditioning elements of further action.

Gerring and Barresi (2003) have suggested a ‘min-max’ strategy to produce a core definition of the concept of culture. They (2003:205) break down this min-max strategy into three steps (as shown in Table 4.6), comprising sampling usage, typologizing attributes and constructing minimal and ideal-type definitions.

Table 4.6: The process of Min-Max Definition (Gerring and Barresi, 2003:205)

1	Sample (sample representative usages and definitions within a linguistic context)
2	Typologize (arrange non-idiosyncratic attributes in a single typology).
3	Define <ul style="list-style-type: none"> (a) Minimal (identify those few attributes that all non-idiosyncratic uses of the term have in common). (b) Ideal-type (identify those attributes that define a term in its purest, most ‘ideal’, form).

“Minimal definitions identify the bare essentials of a concept, sufficient to [bind] it extensionally while maintaining all non-idiosyncratic meanings associated with the term” (Gerring and Barresi, 2003:207). They (2003:207) point out that minimal definitions embody all definitional attributes that are necessary and therefore, are always present. Gerring and Barresi (2003:208) state that in contrast, ideal-type definitions aim for a collection of attributes that is ‘maximal’ in that it includes all non-idiosyncratic characteristics that together define the concept in its purest, most ‘ideal’ form. As Cochrane (2006: 322) argues, the ideal definition is ‘fuzzier’ but the minimal definition has relatively clear borders. Table 4.7 shows attributes of minimal and ideal-type definitions of culture.

Minimal Attributes: Production and Transmission: Characteristics:	Social Ideational or symbolic Patterned Shared
Ideal-Type Attributes: Production and Transmission: Characteristics:	Social Human Ideational Patterned Shared Enduring Cumulative Coherent Differentiated Comprehensive Holistic Non-interest-based Implicit
Functions:	Casual Constitutive

Cochrane (2006:322) and Gerring and Barresi (2003:211) when taken together reveal that culture is a set of beliefs or behaviors in its minimal form which are produced, transmitted and learned socially and often spoken of as a heritage or tradition. Cochrane (2006:322) states that only formal rules and behaviors which signify something other than themselves can be viewed as cultural. Cultures are also captured by social scientists by being recognized as phenomena having the near synonyms such as 'ordered' or 'organized'. Gerring and Barresi (2003:211) use this as an attribute by saying that cultures are patterned. Cochrane (2006:322) believes that there is a degree of pattern to a culture (although it is not always obvious), as humans are born into a culture, rather than randomly producing one. In addition, in terms of both minimal and ideal-type attributes, a culture is shared by a social group such as a nation, an ethnic group, or tribe (see Table 4.7).

A culture, in its ideal type, as well as having the characteristics mentioned above, is enduring in nature (being slow to change), coherent and interconnected, unique to a particular group, and comprehensive and holistic in the range of beliefs and practices covered by it (rather than being one dimensional and related to a single issue). Likewise, beliefs and practices related to culture are general instead of being merely a function of self-interest and formulized. The functions of culture are both casual and constitutive. In fact, culture constrains and influences human actions and influences people and their experiences by imparting a certain recognizable essence.

4.1.2.2. Culture and Environment

This part of the study presents an ecological view of a society and its cultural structure to explore the relationship between culture and environment. It begins with introducing the interaction between an ecological organism and its components with their surrounding environment.

Williams (2007:2) explains that the biosphere (as the livable part of the environment for plants, animals and humans) is composed of the earth plus the sliver of thin air extending out six miles from the earth's surface and that all life in this zone relies on the sun's energy. "The biosphere has specific bioclimatic zones called biomes, which are tailored to their climate, soil, physical features, and plant and animal life" (Williams, 2007:2). Lawrence (2003:31) argues that ecology is defined as a science that deals with the inter-relationship between organisms and their surroundings.

Humans are part of the environment, and all changes in nature and their habitat affects them. It is important to know what is being affected and how. Odum (cited in Williams, 2007:3) devised an ecological model which illustrates the relationship between flows of energy and materials, between system components and between producers and consumers (Figure 4.1).

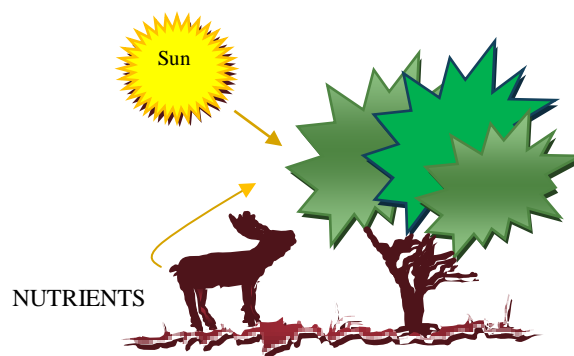


Figure 4.1: Flows of energies and materials in an organism

Williams (2007:3) remarks that all of life functions in the way shown in Figure 4.1. The relationship between the components can be changed by changing the connections and flows between the components and some of these changes can be caused by humans. For example, construction of a dam to increase production of electricity or to contribute to the development of agriculture can change the covering of plants and increase the expansion of desert in the adjacent areas located on the lower levels. This land use change

results in a gain to an organic community (people), but also the loss of contributions from nature, such as failure to access clean water.

Odum's model illustrates the simple and essential relationship between natural energies and renewable resources (Figure 4.1). In this view, becoming a sustainable organism is achieved by using natural energies and renewable resources. On the other hand, an organism is sustainable when all components, micro-organisms and communities are adapted to fit with the natural laws that are dominant in the whole process of energy and material cycles in nature. Humans are not exempted from being compatible with natural laws. In this they are like all other natural organisms.

Using an ecological perspective, culture is a system which as Rapoport (1969) demonstrates has an interconnection with the environment. Culture can be manifested through the religious beliefs, intellectual and spiritual engagement, materials used, and products (such as art, architecture, food, and textiles) of a given group or society. If a society is viewed as an organism, culture can be defined as the way in which physically and spiritually it makes a linkage between the given society and its surroundings.

4.1.2.3. Culture and Development

Development is defined in the Final Report of Mondiacult (cited in Breis, 1992:2) as a complex, global and multi-dimensional process, going beyond mere economic growth to include all dimensions of life and all the energies of a community. In addition all members of a society must take part in the effort to achieve the economic and social transformation of its welfare.

The World Commission on Culture and Development (WCOCAD) (1996) analyzed development in two different ways. Firstly, "according to the standard view, development equals economic growth, sometimes qualified by insistence on a wide spread of the benefits of growth" (WCOCAD, 1996:14). Secondly, as advocated by UNESCO, UNDP's annual *Human Development Report* and many distinguished thinkers, (cited in WCOCAD, 1996:14), development is a process that enhances the effective freedom of the people involved to pursue whatever they have reason to value. WCOCAD (1996: 14) indicates that in this view, not only the lack of essential goods and services, but also a shortage of opportunities to choose a fuller, more satisfying, more valuable and valued existence cause poverty of life. However, this raises the question of whose values form

the benchmark—those of the existing community that may well relate to what the community can have based on sustainable use of the natural resources available, or of those, such as UN thinkers based in the west, doing the assessment?

The cultural dimension of development can be viewed at global, national and regional scales. One of the main aims for such development is promotion of cultural co-operation. Such co-operation between peoples with widely different cultural backgrounds and interests can only be achieved when they all share certain principles. WCOCAD (1996:17) defines five ethical “pillars” as tools for achieving this goal, comprising: human rights and responsibility; democracy and the elements of civil society; the protection of minorities; commitment to peaceful conflict resolution and negotiation; and intergenerational equity. WCOCAD (1996) suggests a top-down approach for cultural development based on these five pillars. This approach emphasizes that “it is incumbent upon all governments to give effect to such principles. But the implementation of a global ethics requires other factors as well: transnational co-operation, international organizations, and the global civil society” (WCOCAD, 1996:17).

4.1.2.4. FCS—a Framework for Cultural Statistics

As explained by The Institute for Statistics of the United Nations Education Scientific and Cultural Organization (UIS) (2010:9), the Framework for Cultural Statistics (FCS) is viewed as a tool for organizing cultural statistics both nationally and internationally. This framework is based on a conceptual foundation and a common understanding of culture that will enable the measurement of a wide range of cultural expression irrespective of the particular economic and social mode of its production. One of the main aims for this framework is the production of internationally comparable data related to cultural activities and products.

According to UIS (2010:9) because of the greater availability of economic data and existence of the many international classification systems, in comparison with the social dimension of culture, the measurement of its economic dimension is more fully developed in FCS. This framework as a classification instrument attempts to incorporate the use of available international classification systems such as the *International Standard Industrial Classification* (ISIC) for cultural production activities, the *Central Product Classification* (CPC) for cultural goods and services, the *International Standard Classification of Occupations* (ISCO) for cultural employment, the *Harmonized Commodity*

Description and Coding System (HS) for international flows of cultural goods, and the *UN Trial International Classification of Activities for Time-use Statistics (ICATUS)* for cultural participation.

The outcome of FCS is a tool and methodology which can be used at the international and national levels as a foundation for organizing the collection and dissemination of cultural data based on using the available economic data. According to UIS (2010:9) FCS makes efforts to reflect the widest range possible of activities related to the production, distribution and use of culture.

One of the main issues related to using FCS as a framework with its related indicators to evaluate products as being culturally appropriate is a shortage of data and information that can cover the social dimension of culture, including cultural participation and intangible cultural heritage. As Horn (1983:25) points out, the scope of culture obviously goes beyond the economic aspects, despite the fact some cultural activities can be fitted into an economic schema of provision of goods and services.

4.1.2.5. Culture Cycle

A framework for cultural statistics contains information and data raised from different sectors of the culture cycle. Thus, exploration and clarification of the culture cycle can portray the areas from which the framework, indicators and data come.

UNESCO (2001) has suggested that “culture should be regarded as the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs” (UIS, 2010:18). Based on this, the culture cycle has been explained by UIS (2010) as shown in Figure 4.2.

The culture cycle covers all of the different phases of the creation, production, and dissemination of culture (Figure 4.2). In this view, culture can be approached as resulting from a cognate set of processes. These processes capture institutionalized and non-institutionalized activities. In addition, these cultural activities may or may not be governed by the state. The culture cycle in the diagram is divided into five stages: creation, production, dissemination, exhibition/ reception/transmission, and consumption/ participation (Figure 4.2). According to UIS (2010:19) these stages are presented in a cyclical

instead of hierarchical model to emphasize the idea that relationships between the latter stages can be complex and occur more as a network than in a linear form.

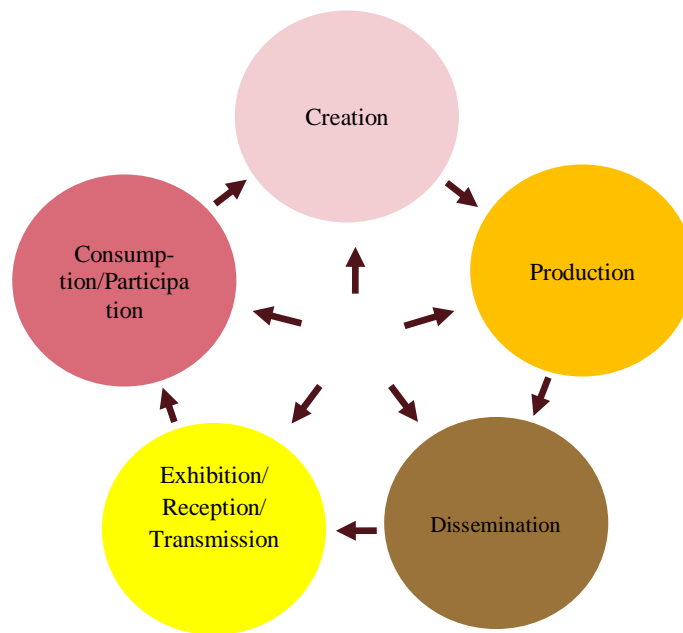


Figure 4.2: Culture cycle (UIS, 2010: 20)

The UIS (2010:20) further explains that the term culture cycle includes the interconnection across cultural activities, including the feedback processes by which activities (consumption) inspire the creation of new cultural products and artifacts. For some cultural activities, the process can be started at any stage of the culture cycle. For instance in terms of cultural heritage, the stages of creation and production have occurred in the past and culture cycle processes related to heritage include the other three stages.

As introduced by the UIS (2010:20), what is important for the culture cycle is to understand and be able to track the totality of activities and necessary resources that are required to transform ideas into cultural goods and products. These, in turn, have to reach consumers, participants or users. This approach is more than just being concerned with making judgments on how ‘cultural’ any specific aspects of the cycle are.

4.1.2.6. Cultural and Related Domains

According to the UIS (2010:22) the FCS uses a pragmatic definition of culture which is based on the representation of culture by domains for which the aim is to calculate cul-

tural activities, goods and services that are produced by industrial or non-industrial processes.

Cultural goods and services capture artistic, aesthetic, symbolic and spiritual values. Throsby (2001) (cited in UIS 2010:22) points out that there are differences between the characteristics of cultural goods and services and other products. Throsby (2001) argues that these differences arise from the system of assigning values to the former, which includes a characteristic of being irreproducible, and which is linked to their appreciation or the pleasure they give. Cultural goods play an important role in conveying ideas, symbols and way of life and cultural services facilitate the production and distribution of these goods. UIS 2010 sets out the FCS cultural domains as shown in Figure 4.3.

Figure 4.3 reveals a set of common culturally productive industries, activities and practices which are represented as domains in the FCS including:

- A: Cultural and natural heritage.
- B: Performance and celebration.
- C: Visual arts and crafts.
- D: Books and press.
- E: Audio-visual and interactive media.
- F: Design and creative services.
- G: Transversal domains (UNESCO 2006 and 2009).

FCS considers these domains to be cultural. According to UIS (2010:23) these domains represent the minimum set of core cultural domains for which UNESCO would encourage countries to collect comparative data. Moreover, four other transversal domains are included: intangible cultural heritage, education and training, archiving and presentation, and equipment and supporting materials, because of their important influences on the culture cycle in terms of production and transmission of culture. These transversal domains can be applied to all of the cultural and related domains (Figure 4.3). As shown in Figure 4.3, related domains are separated into the two categories of: 'H'- tourism and 'T'- sports and recreation.

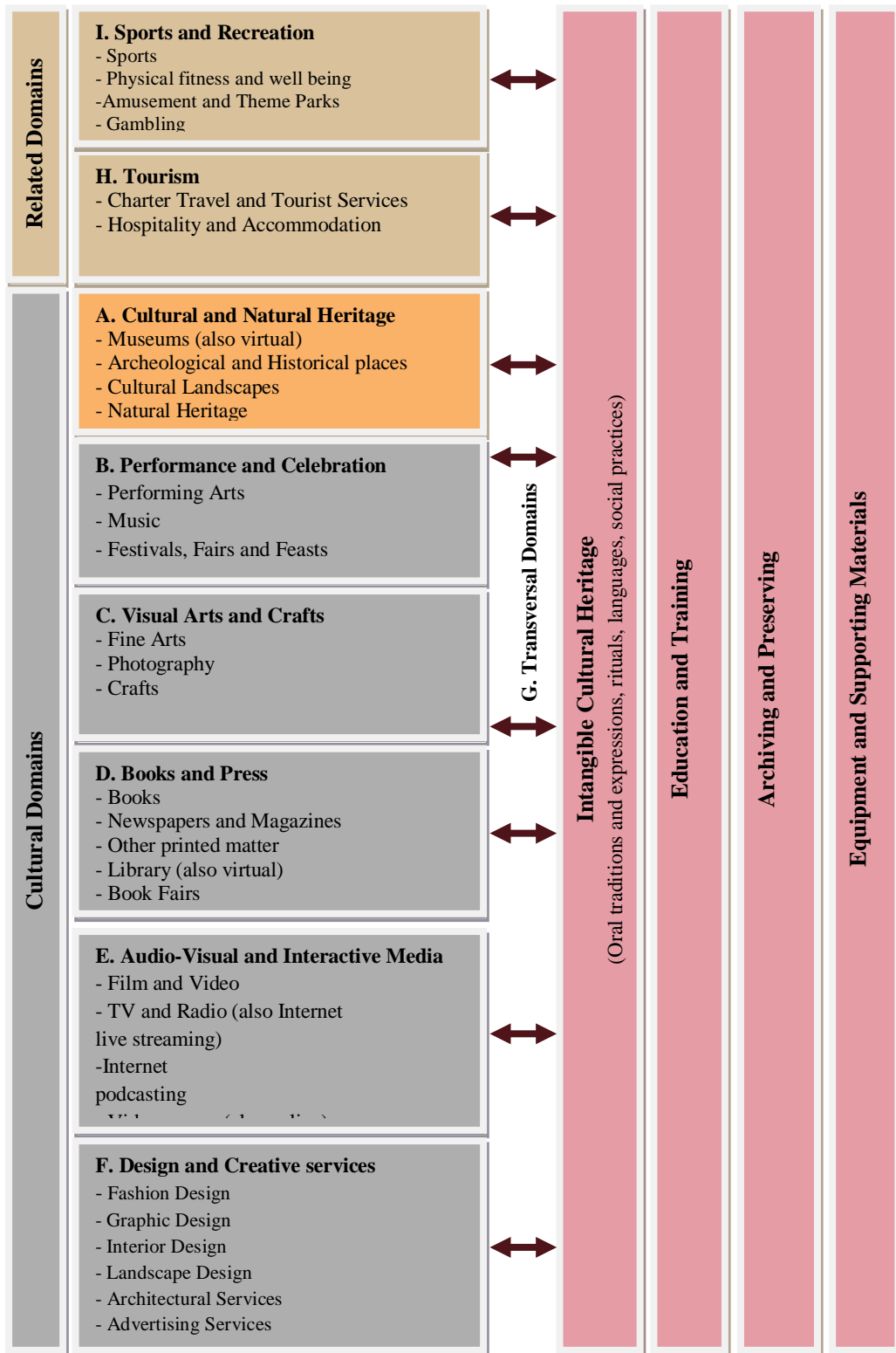


Figure 4.3: Framework for Cultural Statistics Domains (UIS, 2010:24).

4.1.2.7. Tourism as a Related Domain

The UIS (2010:30) views tourism as a domain which is qualitatively different from the other cultural domains, as it cannot be readily classified as a sector in the traditional sense. For instance, it cannot be measured by either a particular market or industrial

output. Rather tourism should be considered as an activity which is intimately related with all other cultural and transversal domains.

The UIS (2010:58) also identifies the most important productive activities and their related products (goods and services) which can be classified in the tourism domain (Table 4.8). Overall these productive activities can be classified into three categories comprising: types of transportation, types of accommodation (short-term accommodation and camping grounds as examples), and travel activities (travel agency, tour operators and reservation activities) (Table 4.8). Moreover the suggested goods and services which are viewed as tourism products are limited to these productive activities.

Table 4.8: Framework for cultural statistics domains—related domains (tourism). (UIS, 2010:58)

RELATED DOMAINS				
Domain	Productive activities		Goods and services	
	ISIC ¹ 4	Description	CPC ² 2	Description
H. Tourism	4911	Passenger rail transport, Inter urban	64131	Sightseeing services by rail
	4922	Other passenger land transport	64132	Sightseeing services by land, except rail
	5011	Sea and costal passenger water transport	64133	Sightseeing services by water
	5110	Passenger air transport	64134	Sightseeing services by air
	5510	Short-term accommodation activities	63111	Room or unit accommodation services for visitors with daily housekeeping services
			63112	Room or unit accommodation services for visitors without daily housekeeping services
			63113	Room or unit accommodation services for visitors in time-share properties
			63114	Room or unit accommodation services for visitors in rooms for multiple occupancy
	5520	Camping grounds, recreational vehicle parks and trailer parks	63120	Camp site services
			63130	Recreational vacation camp services
	7911	Travel agency activities	85511	Reservation services for air transportation
			85521	Reservation services for accommodation
			85523	Reservation services for cruises
85524			Reservation services for package tours	
7912	Tour operator activities	85540	Tour operator services	
7990	Other reservation services and related activities	85512	Reservation services for rail transportation	
		85513	Reservation services for bus transportation	
		85514	Reservation services for vehicle rental	
		85519	Other transportation arrangement and reservation services	
		85539	Reservation services for event tickets, entertainment and recreational services and other reservation services	
		85550	Tourist guide services	
85561	Tourism promotion services			
85562	Visitor information services			

1. ISIC: International Standard Industrial Classification
2. CPC: Central Product Classification

Overall then these products can be divided into the two categories of: transportation and accommodation, within which both categories have their related reservation services

(Table 4.8). The mutual relationship between tourism and other cultural domains through sustainable development of the former obligates consideration of tourism in a wider area, because its domain covers all other cultural productive activities and their produced goods and services. On the other hand, a cultural framework that is aimed to be used as a foundation for cultural indicators in order to evaluate the CF of tourism must contain all the tools used and activities conducted during the development process.

4.1.2.8. Tourism and Transversal Domains

The UIS (2010:28) considers “transversal domains” (used by UNESCO 2006 and 2009) as domains that are viewed transversely because they can be applied across the other cultural domains, although these domains can stand alone as independent domains (Figure 4.3). These transversal domains are discussed in detail below.

4.1.2.9. G- Intangible Cultural Heritage

UNESCO (2003) defines Intangible Cultural Heritage (ICH) as the “practices, representations, expressions, knowledge, skills - as well as the instruments, objects, artifacts and cultural spaces associated therewith - that communities, groups and, in some cases, individuals recognize as part of their cultural heritage” (UNESCO, 2003:2). These are wide ranging definitions and suggest that a heritage which is transmitted from generation to generation and created by communities and groups in response to their environment, their interaction with nature and their history, will have the ability to reflect its identification. Furthermore a unique feature which is defined for ICH by UIS (2010) is that it can be defined as such when a community recognizes this as a part of its heritage.

An intimate link between sustainable tourism and ICH can be manifested such that the cultural framework and indicators related to tourism must contain an expanded range of cultural activities and products that are accepted as heritage by given communities and groups. This means that a top-down approach to the creation of cultural frameworks and indicators at international or national level may ignore local cultural activities or products because, according to their features, these heritage activities can be different from one place to another or different communities at the local scale may have differing cultural heritages.

4.1.2.10. Education and Training

The education and training domain as part of the ICH domain can play an important role in the expansion of the tourism domain and its related activities and products. According to UIS (2010:31) FCS refers to the cultural dimension of tourism, embracing cultural tourism, spiritual tourism and ecotourism activities. In this view, FCS defines cultural tourism as a “customized excursion into other cultures and places to learn about their people, lifestyle, heritage and arts in an informed way that genuinely represents their values and historical context including the experiencing of difference” (UIS, 2010:31). Accordingly this definition can also cover spiritual tourism or ecological tourism (ecotourism).

This definition shows that learning about culture is a core activity for cultural tourism and all other cultural activities and related goods and services can be used in the process of learning or education through the development of tourism. On the other hand education can be conducted in different ways, such as learning about culture by having face to face contact with local people, visiting museums, direct interaction with architectural spaces, or by using photography as a tool to record cultural events. These characteristics of education allow viewing it as a part of comprehensive framework which has the ability to define cultural indicators and to evaluate the CF of sustainable tourism and its sub-segments such as ecotourism.

4.1.2.11. Cultural Capital and Production of Goods and Services

One of the important goals for the sustainable development of ecotourism is the production of welfare, goods and services for host communities and visitors. Cochrane (2006:321) presents a model to introduce the role of interaction between cultural capital and other forms of capital, such as natural capital, human-made capital and cultivated natural capital, to produce welfare, goods and services for users, as shown in Figure 4.4.

In this model human-made capital is produced by the use of natural capital through its provision of raw materials and environmental services. Sinks for human produced waste products are also a part of natural capital (Figure 4.4).

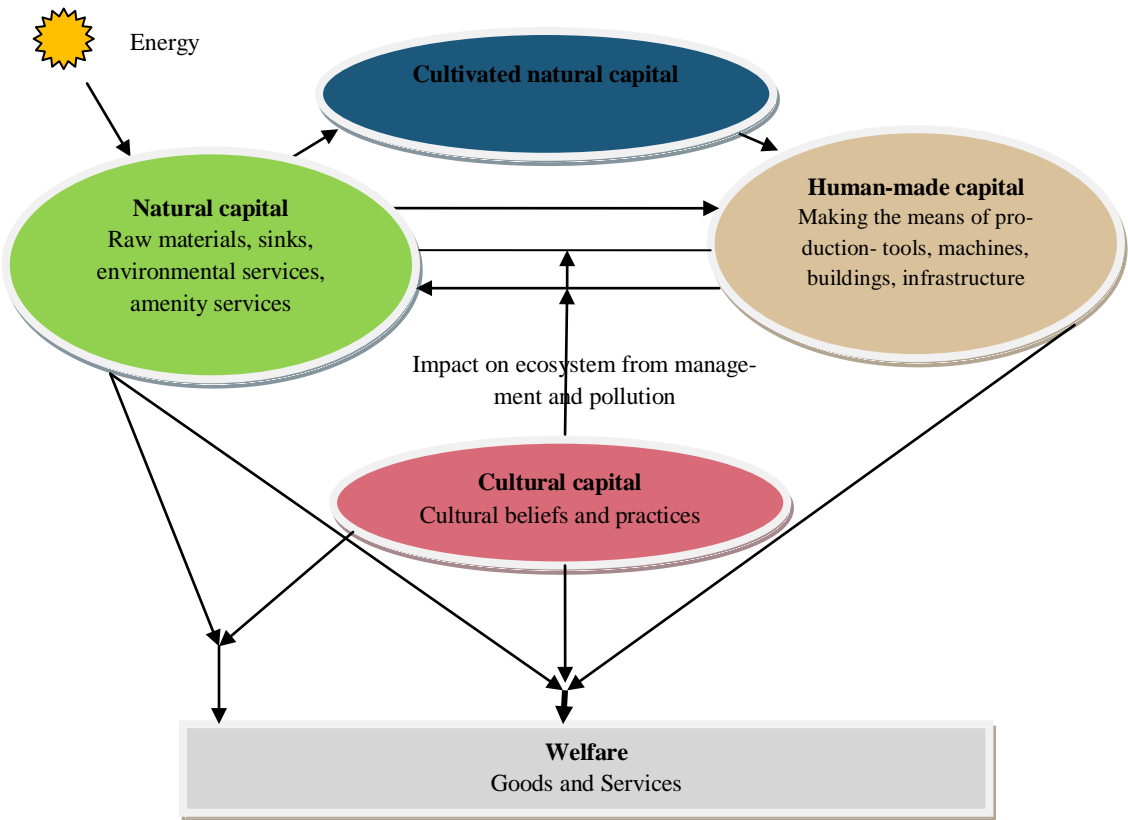


Figure 4.4: The interaction between forms of capital and the protection of welfare (Cochrane, 2006:321)

Although the processes described above will deplete natural capital stocks, this depletion can be reduced by replacing what is taken with renewable natural resources, for instance by planting trees or composting organic wastes. Berkers and Folke (1994, cited in Cochrane, 2006:321) argue that cultural capital is positioned at the interface of natural capital and human-made capital and plays an important role in mediating and controlling natural capital and human made capital interactions. Berkers and Folke (cited in Cochrane, 2006:321) also explain the fundamental and co-evolutionary relationship between the different types of capital. In this example, three forms of capital combine to produce final products (welfare, goods and services). Indeed, these products are dictated by the nature of the latter capitals. This again illustrates the complex nature of culture (society), environment and economy. In fact the idea that they can be simply separated, as in the weak sustainability model, may be impossible. This idea will be explored further in this part of the thesis.

4.1.2.12. Cultural Frameworks and Indicators for the Evaluation of Tourism

Products: examples

a. Choi and Sirakaya Model (2006)

A 2006 study by Choi and Sirakaya presented sustainability indicators for the measurement of community tourism development (CTD) within a sustainable framework. In order to develop such objective indicators their study employed a modified Delphi technique. The Delphi technique is “a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem” (Linstone & Turoff page, 1975: 3). According to Linstone and Turoff (1975) and Wechsler and Wolfgang (1978) in the Delphi method, the experts answer questionnaires in two or more rounds. The earlier answers of the experts are revised in light of the feedback from other members of their panel. Through this process the range of answers will decrease and the group will converge towards a single answer. Finally, the process is stopped after a pre-defined stop criterion (e.g. number of rounds,) and the final results are indicated as the mean or median scores of the final rounds.

According to Choi and Sirakaya (2006:1274), based on the Delphi technique, a panel of 38 academic researchers in tourism, after three rounds of discussion, reached consensus on the set of 125 indicators which were divided into six categories: political (32), social (28), ecological (25), economic (24), technological (3) and cultural dimensions (13) for CTD.

Choi and Sirakaya (2006:1274) further reveal that if the changes wrought by tourism upon all aspects of community life are to be effectively tracked, the latter indicators must be based on policy relevance, analytical soundness, and measurability. They (2006:1275) point out those indicators with these characteristics can be used in various settings and particularly at the local level where it matters the most.

Choi and Sirakaya (2006) suggest that sustainable community tourism (SCT) is comprised of ecological, social, economic, institutional/political, cultural and technological dimensions at the international, national, regional and local community levels, and within agriculture, tourism, political science, economic and ecology. However much of the literature on sustainable tourism has focused on the traditional dimensions (economic, social, cultural and ecological dimensions), and the other dimensions (political and technological) have been viewed as sub-segments of the main traditional dimensions.

As a result, in comparison with Choi and Sirakaya's (2006) framework with its greater number of dimensions, the traditional view suggests simpler frameworks and indicator sets that could be used to evaluate sustainability through tourism.

According to the latter view, Choi and Sirakaya (2005:1281) have suggested some indicators for evaluation of the cultural dimension of sustainability through the development of tourism (Table 4.9). As shown in Table 4.9, the cultural framework is divided into the four domains of: building and architecture, cultural (site) management, socio-cultural fabric, and cultural education. According to the basic definitions of culture which have been presented in this section, all the cultural domains (Table 4.9) are interwoven together and in some cases the indicators which are suggested for a particular domain could be used as indicators in the other domains. For instance, types of building material and décor could be used as an indicator to evaluate goods and services which are produced in relation to cultural education or cultural (site) management.

Table 4.9: Indicators for the cultural dimension (Choi and Sirakaya, 2005:1282)

Key themes	Indicators/Issues
Building/architecture	Comparability of new construction with local vernacular
	Types of building material and décor
Cultural (site) management	Cultural sites maintenance level
	Availability of cultural site maintenance funds and resources
	Commodification
	Number of officially designated sites and their management
Socio-cultural fabric	Retention of local customs and language
	Shift in level of pride in local cultural heritage
	Percent satisfied with cultural integrity/sense of security
	Loss of authenticity and becoming impersonal
Cultural education	Type and amount of training given to tourism employees (guides)
	Type of information given to visitors before and during site visits (e.g. tourist in-flight video or public awareness material)
	Level of sensitivity of interpretive material and activities pursued

One of the important policy actions to further simplify cultural frameworks and indicators and the evaluation of the CF of ecotourism, is to distinguish the cultural domain(s) that have the ability to cover other domains, indicators, cultural goods and services. This can be conducted by using the Delphi methodology. This method can reduce the number of frameworks and make linkages between indicators which are currently viewed as being separate.

b. Cultural Framework for New Zealand

In 2006 the New Zealand government put forward a cultural outcomes framework which by 2009 had been justified and improved (Tables 4.10 and 4.11). According to Statistics New Zealand (SNZ) (2006:1), the government has recognized that a sense of nationhood and identity depends to a significant extent on actively supporting New Zealand's arts, culture and heritage. Likewise, it has admitted that economic growth, social cohesion, the acceptance and encouragement of diversity, and creative thinking in a range of fields can be contributed to by confidence in that culture, an appreciation of its unique aspects, and a strong sense of cultural identity.

The cultural sector is considered by government as a factor which is driven by an infinitely renewable resource - human creativity - that, when given nourishment and contribution, provides the potential for job creation through the generation and exploitation of human intellectual property. Because of these characteristics, the cultural sector plays a pivotal role in the New Zealand government's goal of achieving sustainable development.

The New Zealand government has proposed a number of themes to structure the development of cultural indicators. These themes are divided into the five domains of: engagement, identity, diversity, social cohesion, and economic development (Table 4.10). A number of desired outcomes are set under each theme. The total 10 outcomes that have been proposed are set out in Table 4.10. These outcomes attempt to create a significant environment for the engagement of New Zealanders in the cultural dimension of the sustainable development process as participants, consumers, creators, and providers or as decision-makers, all with equal access to cultural capital. In this cultural framework, the cultural structure of New Zealand is viewed as an integration of the cultures of Maori and Pakeha in which both cultures are respected and valued by New Zealanders. This outcome can also foster a tolerant and inclusive society. In addition, it is anticipated that the cultural outcomes will enhance community-based development by the involvement of New Zealanders in sustainable development through cultural activities.

Culture-based economic development is another proposed outcome in Table 4.10. Although, as indicated in Table 4.10, the arts, culture and heritage make a growing contribution to the economy, sustainable development of the economic system ultimately has

a relationship with the other outcomes. For example, participation of local people in economic activities and equal distribution of capital are both recognised pillars of sustainable economic development. The related indicators are described in Table 4.11.

Themes	Outcomes	Related Indicators
Engagement	Engagement: New Zealanders engage in arts, culture and heritage events and activities as participants, consumers, creators or providers	Proposed indicators 1a,1b,1d,1f
	Environment: There is an environment that supports creativity and innovation for all cultures.	1b, 1c
	Access: All New Zealanders have access to arts, culture and heritage events and activities.	1d, 1e
	Value: Art, culture and heritage activities are valued by New Zealanders.	1a, 1b, 1d, 1f
Identity	New Zealanders have a strong sense of identity, based on their distinct heritage and cultures.	2a, 2b, 2c
	Strength: The cultures of Maori and Pakeha are strong and living, with both cultures being valued by New Zealanders.	2a, 2b, 2c
Diversity	Diversity: New Zealand's growing cultural diversity is freely expressed, respected and valued.	3a, 3b
Social cohesion	Enhancement: Community relationships are enhanced by involvement in arts, culture and heritage events and activities.	No current proposed indicators
	Cohesion: New Zealanders' shared cultural identity fosters a tolerant, inclusive society.	No current proposed indicators
Economic Development	Development: Arts, culture and heritage make a growing contribution to the economy.	5a, 5b, 5c

b. 1. Cultural Indicators for New Zealand

The proposed cultural indicators for New Zealand (2009) form a justified model for cultural indicators, which have been developed by Statistics New Zealand (SNZ) from those of 2006. As shown in Table 4.11, indicator 1d which is described in SNZ (2006: 18) as “How often people experience cultural activities, on average”, has been changed in SNZ 2009 to “cultural experiences” (Table 4.11). Furthermore, the five indicators 1g, 1h, 2d, 2e and 3c have been added to the first set of cultural indicators in 2009 (Table 4.11).

Table 4.11 shows that a total of 19 cultural indicators are proposed for New Zealand in 2009. According to their definitions (Table 4.11) eight of them (1a, 1b, 1c, 1f, 3a, 5a, 5b and 5c) are cultural-economic indicators and 11 of them can be viewed as indicators which particularly focus on cultural experiences, events and heritage. Although economic indicators cover 42% (8 out of 19) of total cultural indicators for New Zealand,

as Table 4.10 shows, 52% (12 out of 23) of the indicators which are set out in the outcomes are economic based indicators.

Table 4.11: Cultural indicators for New Zealand (SNZ, 2009:6-76)

T ¹	Ind ²	Title	Definition
Engagement	1a	Cultural employment	The number of people in cultural employment as a percentage of total employment.
	1b	Employment in creative occupations	The number of people employed in creative occupations as a percentage of total employment.
	1c	Median incomes from creative occupations	The median income received by people in creative occupations ¹ as a percentage of the median income of all employed people.
	1d	Cultural experiences	This indicator is expressed as the average (per adult) frequency of experiencing cultural activities.
	1e	Barriers to cultural experiences	This indicator is expressed as the proportion of adults encountering barriers which prevent them from experiencing particular cultural activities.
	1f	Household spending on cultural items	This indicator shows the value of household spending on cultural goods and services as a proportion of all household expenditure.
	1g	Heritage protection	The proportion of those sites either registered with the New Zealand Historical Places Trust, or listed as places with historical value in territorial authority District Plans that have been destroyed, relocated or partly removed during the period.
	1h	Access to arts, culture and heritage activities and events	The proportion of shows, performances and exhibitions at a sample of venues outside the five main centers.
Cultural Identity	2a	Speakers of te reo Maori	This indicator is expressed as the proportion of Maori able to hold an everyday conversation in Maori.
	2b	Local content on television	This indicator is expressed as the first run hours of local content, as a proportion of the total television schedule. Local content is generally defined as material that is both predominantly made in New Zealand and reflects New Zealand identity and culture.
	2c	Maori TV ratings	This indicator is expressed as the viewer ratings for Maori TV by Maori, non-Maori and all viewers of this channel.
	2d	The importance of culture to national identity	The proportion of New Zealanders who believe that culture and cultural activities are important to New Zealand's sense of national identity.
	2e	New Zealand events	Proportion of New Zealand shows, performances and exhibitions at a national sample of venues.
Diversity	3a	Grants to minority ethnic cultural groups	This indicator is an index of the percentage of grants made by the New Zealand Lottery Grants Board (LGB) for arts, culture and heritage purposes to non-Maori and non-New Zealand European ethnic organizations and individuals, relative to those ethnic groups' percentage in the population of New Zealand.
	3b	Attendance /participation at/in ethnic cultural activities	This indicator is expressed as the percentage of the population aged 15 years and over attending/participating in at least one cultural activity in the year before survey.
	3c	Minority culture activities	The proportion of arts, culture and heritage events and activities produced by minority cultures, taking place at a national sample of venues.
Social Cohesion	-	No indicator	
	-	Non-Maori attendance at Maori cultural events.	Proportion of non-Maori attending a sample of Maori cultural events

	-	Other ethnicities attendance	Involvement in community arts, cultural and heritage groups which are not Maori or New Zealand European /Pakeha.
	-	Community cultural experiences	The percentage of people taking part in religious activities, ethnic cultural activities, and other secular activities (NZFCS sub categories 811, 821 and 822), and the frequency of participation.
Economic development	5a	Income of the cultural industries	This indicator is expressed as the value of the sales of goods and services and other income of the cultural industries in constant prices.
	5b	Value added contributed by the creative industries	This indicator is expressed as the value added by the creative industries in year 2005 dollars expressed as an index (2005 equals 100 on the index).
	5c	The creative industries' proportion of total industry value-added	This indicator is expressed as the proportion of total industry value added produced by the creative industries. It can be read in conjunction with the previous indicator (5b), which measured changes in value added in the creative industries. Total industry value added is gross domestic product less unallocated indirect taxes (i.e. less GST, import duties and stamp duty).
1. T: Theme 2. Ind: Indicator			

c. Integrated Cultural Frameworks and Indicators for New Zealand

Figure 4.5 proposes a model for the integration of the FCS and the cultural framework and indicators for New Zealand. This model shows that there are mutual relationships between the themes proposed by SNZ (2009) and the cultural domains suggested by UNESCO, 2009 (cited in UIS, 2010) (Figure 4.5).

The model shows that all cultural domains and related domains can be set under each of the themes (Figure 4.5). On the other hand, the cultural domains, their productive activities and their related cultural goods and services can be viewed as factors in which each theme must be involved in order to achieve its complete anticipated outcomes. For example, in terms of the engagement of New Zealanders in cultural activities, this can be placed into the 8 categories of: engagement in cultural heritage; performance and celebration; visual arts and crafts; books and press; audio-visual and interactive media; design and creative services; tourism; and sports and recreation (Figure 4.5).

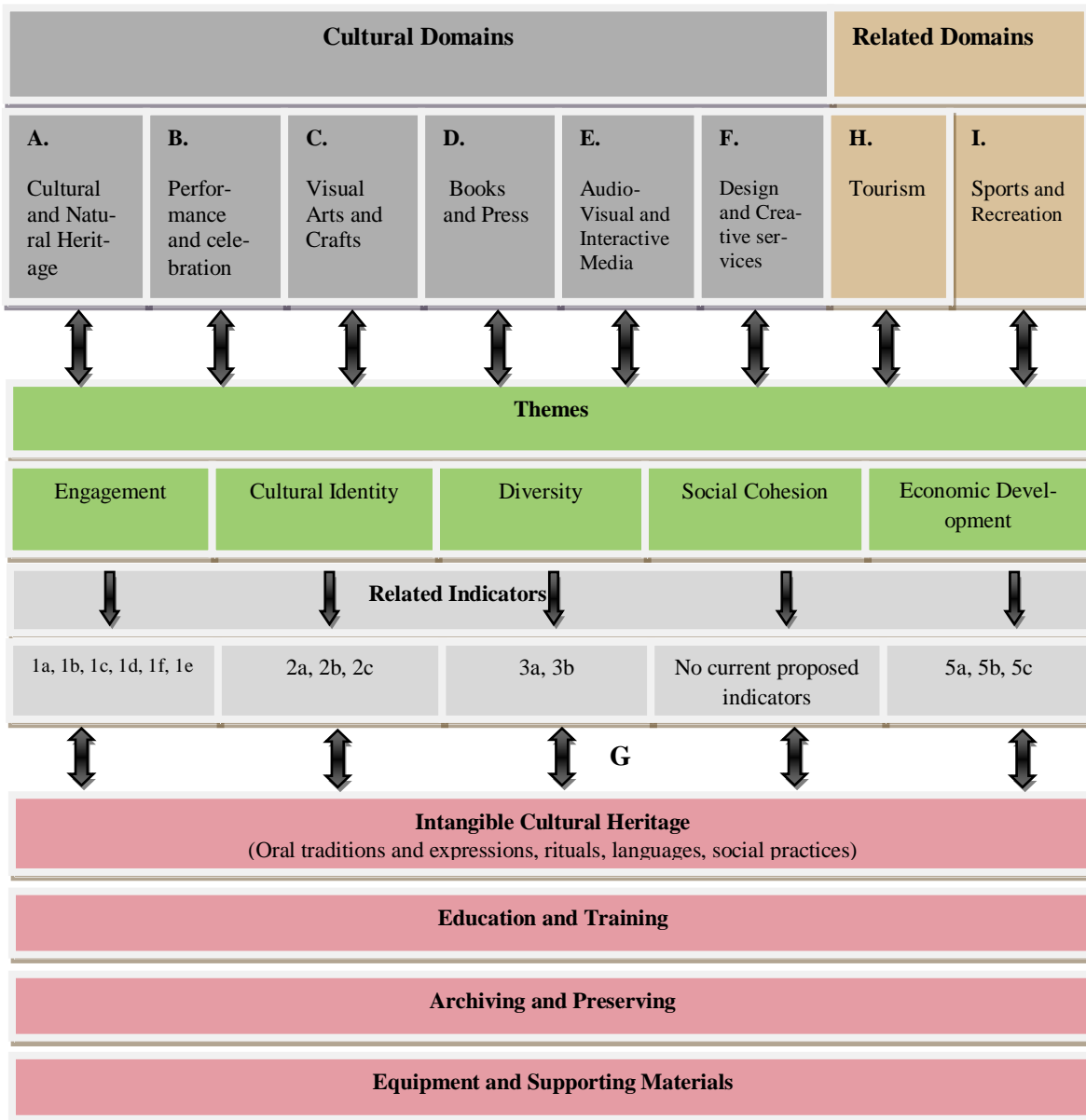


Figure 4.5: Integration of FCS cultural domains and indicators

Tourism can also be considered as a related domain in which most of the proposed themes are involved (Figure 4.6). On the other hand, the anticipated cultural outcomes for sustainable development of tourism can be categorized as subsets of the themes that are introduced in Figure 4.6.

The cultural outcomes of tourism and the goods and services produced for it can be considered as pivotal and supporting tools which are set under the transverse cultural domains and in particular the education and training domain (Figure 4.6). These outcomes in terms of goods and services can be used as educational tools to make a host society into a place for cultural education.

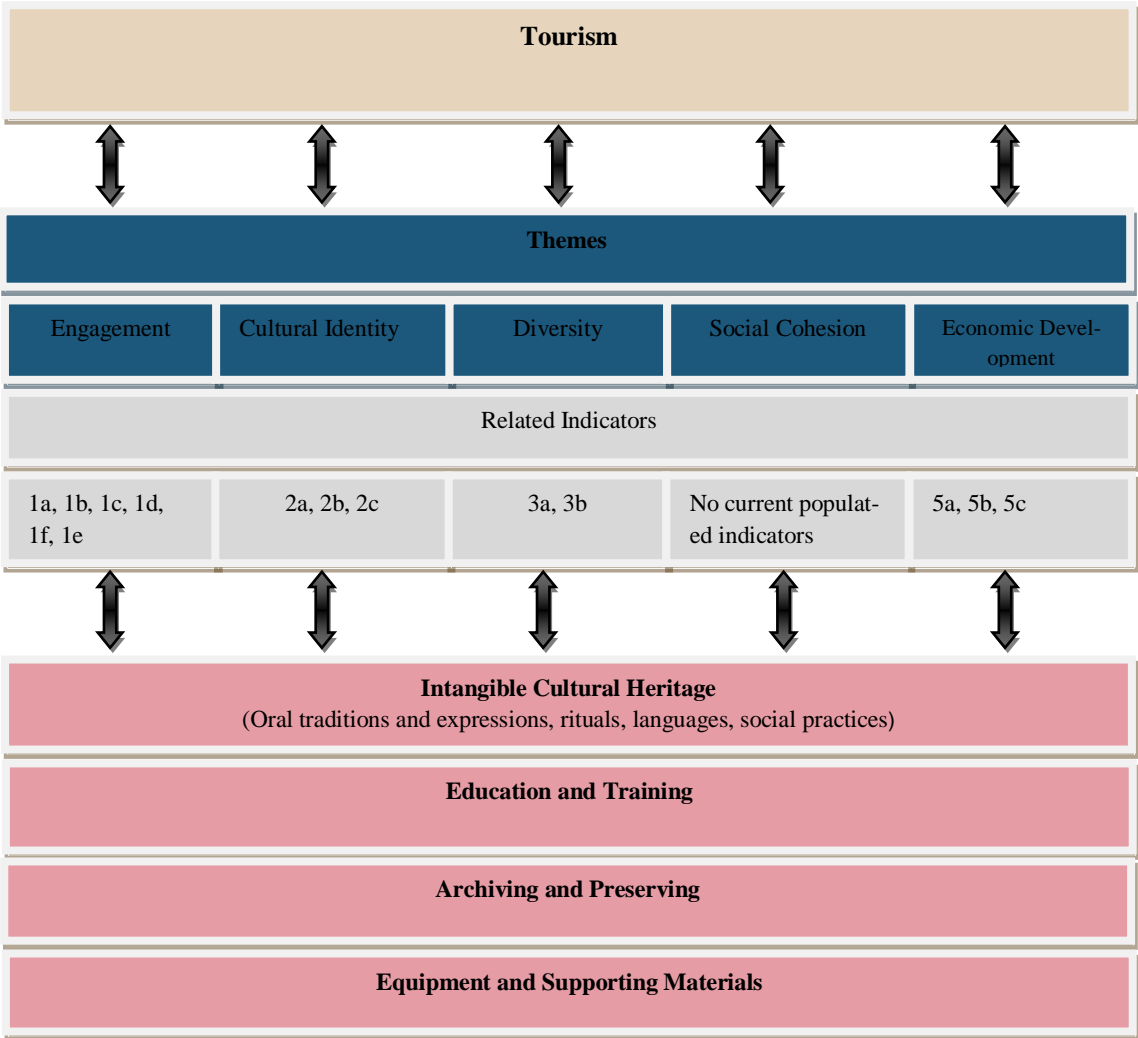


Figure 4.6: Tourism, FCS cultural frameworks, and SNZ themes and indicators

Schianetz et al (2007:1485) reveal that sustainability must be conceived of as a transition and learning process, and as a “moving” rather than a static goal. They (2007:1485) state that these findings are particularly important with respect to the tourism industry, which is an inherently non-linear, complex and dynamic system that has to be managed adaptively.

Schianetz et al (2007:1485) explain that adaptive management approaches are based on continuous and collective learning concepts that acknowledge uncertainties, and allow for timely adjustment of planning and management strategies. This implies that in order to advance sustainability in the tourism industry, approaches are needed that promote learning at an organizational as well as a place related destination or regional level. In this view sustainable tourism with its social-cultural essence can be considered as a potential form of education (learning).

Minnaert et al (2009:320) reveal another approach in which the focus is on ideas, in terms of experiential learning that is linked to experience in a non-institutionalized setting, such as going on holiday. According to Minnaert et al (2009:321) learning which is rooted in experience was introduced at the end of the 1970s and during the 1980s, and it represented an alternative to the more traditional, cognitive learning theories. It can be explained as education that “begins with the experience followed by reflection, analysis and evaluation of the experience” (Boydell, 1976, cited in Minnaert et al, 2009:321). From this perspective, tourism activities can offer participants the chance to envisage new situations, meet different social interaction situations, and compare these to their behavior patterns. For instance, a holiday can create an opportunity for visitors to explore a new environment, engage in new activities, and meet exotic societies and cultures. It can provide the encounters participants need to start their cultural education, even if this education is not anticipated.

Cultural education and learning through participation in tourism can be explained as a comprehensive social activity which “reintroduces people to their cultural roots and reinvigorates people’s interest in [their] history and culture” (McKercher et al, 2005:539), and which is largely rooted in participating in community-based practices carried out by the host communities and related organizations. In this view, the forecasted indicators for each theme can be used as indicators to evaluate the cultural footprint of tourism on both the host communities and visitors through development of this educational process.

4.1.2.13. Cultural Framework for Sustainable Development of Ecotourism

a. Cultural Outcomes

Based on the educational approach described above, the cultural outcomes for sustainable development of tourism can be put into the eight categories shown in Table 4.12.

Table 4.12: Cultural outcomes for sustainable development of tourism (based on cultural education).

Development of Tourism based on Cultural Education	Cultural Outcomes
	Awareness of local participants about their existing cultural heritage and the methods to protect this through the educational process.
	Participation of local people in the cultural development process (programming, management and monitoring for the production, consumption and presentation of cultural products)
	Democratized environment for participation of people in cultural development with equal access to the cultural sources.
	Culture-based development of economic systems that guarantees equal distribution of cultural capital and income among the local people.
	Combination of ordinary tourism activities with compatible cultural activities
	Protection and restoration of tangible cultural heritage
	Protection and restoration of intangible cultural heritage (oral traditions and expressions, rituals, languages, social practices)
	Tourist experience of authentic culture (as the better alternative) or staged authentic cultural heritage of the host destinations.

a. 1. Awareness

One of the main stages in the cultural development process is the awareness of local people and communities about what they have in terms of their cultural capital and heritage. Reid et al (2004:626) introduce ‘Community Awareness Raising and Value Identification’ as one of the important components of the model for community tourism (and ecotourism) development planning offered by him (Figure 4.7.). This model provides a macro framework for community tourism development planning focused at the local level.



Figure 4.7: Community tourism planning model (Reid et al, 2004:625)

As shown in Figure 4.7, the model's third step concentrates on raising community awareness about tourism. This awareness can be introduced in terms of the tourism development process, local cultural, environmental and economic potentials and values, market, products, and impacts of tourism on the host destination.

As a first stage in the engagement of local and indigenous people in the development process, they should know about their cultural values that may have been ignored or hidden behind new lifestyles. This outcome can be achieved by education of the host people through an educational process that needs particular programming, management and a supportive environment and necessary equipment. The number of people who participate in the educational process and the time that they spend in learning, as well as the places and tools which are allocated for education, can be considered as indicators for the cultural footprint of tourism. Without this initial education, ecotourism as cultural tourism that engages with the local community will not be possible. In addition, how well this engagement occurs and how much it benefits the local people is also dependent upon the type and level of education.

a. 2. The Participation of People in the Development Process

Local and indigenous participants who belong to the host culture and have significant knowledge about their cultural capital can play an important role in terms of programming, management and monitoring for the production, consumption and presentation of cultural products (Table 4.12). However, the necessity for the existence of related communities and NGOs to organize this process is unavoidable. Furthermore, another role for these NGOs and communities is to harmonize the local development policies with national strategies for development. As a result, sustainable development of ecotourism, based on cultural education, can be considered a community based activity within the wider national goals.

a. 3. A Culturally Sensitive Economic System

The culture based development of economic systems is another anticipated outcome for sustainable development linked to ecotourism. From this viewpoint, as some convergence theorists have argued "culture changes with each stage of economic development" (Frederking, 2002:107). As host communities and groups progress through the various stages of development, a convergence of the cultural values will be created. This view emphasizes the influences of economic development (as a dominant theme)

on cultural systems. In contrast others have argued that “culturalists maintain that the groups preserve their unique traits” (Frederking, 2002:107). According to this view, “different cultures create and perpetuate models of development which may be similarly economically successful and simultaneously rich in the norms and values which underlie those activities” (Frederking, 2002:107). This has a relationship with the earlier discussion of Kerman in Iran. Although the city has developed in a modern way, the historic area at the centre of the city, normally the most expensive land in any city, is so linked to the cultural and religious values of the residents that it has been retained, virtually unchanged. This is a group preserving its unique traits.

Frederking (2002) presents a comparative study to explain different empirical examples in terms of the existence of an endogenous relationship between culture and economic development. The Punjabi community in Southall, London (which is commonly referred to as “Little India” in London) is introduced as his first case study. Frederking (2002) portrays “Little India” as a community which has created an ethnic enclave and, by separating the community geographically, one whose culture appears to be a consistent and integral part of their economic activities. According to Frederking (2002:108) in Southall, the main characteristic of “Little India” is the production and consumption of Indian cultural products such as the Indian language, food, and books. In addition, most of the businesses and services and productive activities are managed or owned by Punjabis. As a result of the social-cultural and economic dominations of Punjabis in Southall, according to Frederking (2002:108), a very profound image of Southall emerges, which from even a brief encounter with the area is the image of a self-contained, self-sufficient community.

The Gujarati community in Wembley, London is the second area which Frederking (2002) uses to discuss cultural and economic mechanisms. Frederking (2009:109) argues that in Wembley, at the same time that Indians appear to be the majority group in the neighborhood, in contrast with Southall, the community is far from being an exclusively Indian area. He points to the multi-ethnic face of Wembley, with much more diversity in terms of individuals and business activities. Evidence comes from the local offering of western variations of Indian products, thus creating a difference between Wembley and Southall.

The Punjabi and Gujarati communities present two different aspects in terms of the relationship between economic mechanisms and culture in an area. The Punjabi community attempts to conserve its cultural heritage by isolation of the community from foreign cultures, including that of the host country, whereas the Gujaratis have created a multi-ethnic economic system which leads to close relationships and interactions between various cultures. Although the Gujarati community mechanism may have negative impacts on the authenticity of the cultural products, it creates an environment for engagement of different social fields in the development process. However the main cultural structures and behaviors are changed in Wembley through being influenced by consuming western products, so that an equal opportunity for presentation of cultural products is available for the different ethnic groups.

A culture based economic system for the sustainable development of tourism could be created by the combination of the positive dimensions of the two latter economic systems. According to the Punjabi pattern, a tourism economic system must be managed and developed by local or indigenous participants and communities. In addition, production and consumption of the host cultural products must have a priority over imported foreign products. However, according to the Gujarati pattern, if the host area is part of a multicultural community, all participants with different cultures should have an equal opportunity to present their cultural products and conserve their heritage. Therefore, a culture based economic system related to both mono-cultural and multi-cultural communities must contribute to an equal distribution of cultural income streams between the local participants.

These discussions suggest that employment of local people in culture based economic activities, gross domestic cultural products, and moves to restore and protect cultural heritage can be used as indicators to evaluate the economic outcomes of ecotourism that is culturally appropriate.

a. 4. Combination of Ordinary Tourism Activities with Compatible Cultural Activities

Localized foreign tourism activities as a result of tourists originally coming from other areas with different cultural and behavioral patterns can be considered as one of the main outcomes for tourism development. This outcome can be achieved by the combination of some ordinary tourism activities (such as hunting, fishing, boating and horse

riding) with compatible host cultural activities. For example, in New Zealand hunting, as an example of an ordinary tourism sporting activity, can be combined with learning about the methods and equipment which have been used by Maori people for hunting, as these are part of their historical and cultural activity and products. In this case, an ordinary tourism recreational activity substantially shifts to being a cultural-educational activity managed and presented by Maori participants. The number of visitors who participate in these culturally justified activities can be used as a cultural indicator for the development of tourism (and ecotourism) as being culturally appropriate.

a. 5. Protection and Restoration of Tangible Cultural Heritage

Tangible cultural heritage, which covers the wide domain of physical cultural resources, includes “movable or immovable objects, sites, structures, group of structures, and natural features and landscapes that have archeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance” (World Bank, 2010:173). The World Bank (2006, cited in the World Bank 2010:173) recognizes that physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people’s cultural identity and practices.

These physical cultural resources are subjects that could be restored and protected through the development of sustainable ecotourism. These heritages can be viewed as having the potential to attract visitors to the host areas and also as part of the participation of visitors and indigenous peoples in the cultural-educational process. The level of restored physical cultural resources can be used as a measurable indicator for ecotourism development. However the quality of restoration and protection must be also qualified according to the relevant standards and restoration must be conducted and approved by appropriate processes.

a. 6. Protection and Restoration of Intangible Cultural Heritage

According to UNESCO (2003:2), and as quoted above, the intangible cultural heritage is a combination of cultural knowledge and skills and the artifacts these produce that a community of individuals would regard as part of their cultural heritage. This intangible cultural heritage is transmitted from generation to generation and is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history. UNESCO (2003:2) sorts intangible cultural heritage into five cat-

egories: oral traditions and expressions, including language as a vehicle of intangible cultural heritage; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship.

Preservation and restoration of the intangible cultural heritage, as one of the cultural outcomes for the sustainable development of tourism, can be achieved through the development of community based cultural activities and events such as traditional celebrations, festivals and concerts. Likewise, cultural goods and services such as local foods, some types of accommodation services, art, crafts, and vernacular sports can be considered as tools which have the ability to make explicit intangible cultural values for visitors. For example, some types of accommodation services that create an opportunity for visitors to stay with the local or indigenous people, contribute to them learning about the intangible cultural heritage of their hosts through the consumption of traditional products such as local foods, language, and through using vernacular equipment and spaces.

The proposed indicators for protection and restoration of intangible cultural heritage cover the cultural products, goods and services that contribute both to the way host communities can present their intangible cultural heritage, and to visitors who “come to feel rather than to gaze” (Poria et al, 2003:238) so they can become familiar with the deeper features of the host culture.

a. 7. Authentic Culture or Staged Authenticity at the Host Destinations

Development of ecotourism based on cultural education focuses on the concept of authenticity as one of its outcomes. Cohen (1988:373) argues that authenticity is an eminently modern value whose emergence is closely related to the impact of modernity upon the unity of social existences. In pre-modern society, identity has been defined primarily by social place and the individual has been identified and constituted in and through the certainty of his or her social role.

Cohen (1988:373) further argues that as institutions become “weightless” and lose their reality, the individual within them is said to turn into himself. Since modern society is inauthentic, the modern man who desires to overcome the contrast between the authenticity seeking self and society has to seek elsewhere for an authentic life.

The opposition between self and society which has now reached its maximum could be reduced by the sustainable development of ecotourism. As a solution, the quest for authenticity must be considered as one of the prominent motifs of sustainable ecotourism. Ecotourism can give an opportunity to visitors who desire to obtain experiences and products that are authentic, by the production and presentation of original and local products that are not contaminated by being fake or impure. These authentic cultural products can be used as indicators to evaluate the footprint of ecotourism related to the authenticity of the host community's life and their products.

b. Cultural Indicators for Development of Tourism based on Cultural Education

This section discusses the main characteristics of cultural indicators and proposes indicators that can be used to evaluate ecotourism and its related products and activities as being culturally sustainable.

b. 1. The Main Characteristics of Cultural Indicators

Madden (2005:221) introduces a cultural indicator as a statistic that can be used to make sense of, monitor, or evaluate some aspect of a culture, such as its architecture, or cultural policies, programmes, and activities. The USAID defines an indicator as “a variable [whose] purpose it is to measure changes in a phenomenon or progress” (MDF Training and Consultancy (MDF), 2005:1).

Cultural indicators can be categorised into the two types of quantitative and qualitative indicators. “Quantitative indicators measure change through numerical or statistical facts or physical outputs” (Chapman, 2000:2) and “qualitative indicators are language-based descriptions of cultural phenomena” (Madden: 2005:220). MDF (2005:1) reveals that an indicator is a quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect changes connected to an intervention, or to help assess the performance of a development actor.

A cultural indicator as defined by SPC (2010:2) is a measure that points out something about the state or situation of a culture in a country. SPC (2010:2) explains that these indicators can be narrowed down within the regional and local scale to measure more specific areas of culture such as oral culture (as intangible culture constructed / expressed in local language), traditional practice (skills/ values), arts, crafts, vernacular architecture and cultural sites.

The Ministry of Culture, Madrid, Spain (MCMS) (1985:68) has defined a cultural indicator as a direct and valid statistical measurement that makes it possible to observe the level of a fundamental cultural concern and its variations over a period of time. Arising from this definition, this thesis proposes two fundamental properties for a cultural indicator:

- First, “it must be a direct measurement, that is, it must refer to the very essence of the cultural concern and not to the instruments or agencies used to satisfy that concern” (MCMS, 1985:68).
- Second, “it must be valid in the sense that changes in the indicator must correspond to changes in the cultural element being measured, it being assumed that there is no variation in these remaining elements” (MCMS, 1985:68).

In addition to these two fundamental properties, MCMS (1985:68) suggests further requirements for a cultural indicator including:

- Capacity for aggregation and disaggregation
- Comparability in space or time
- Intelligibility
- Comprehensiveness
- Capacity for co-ordination
- Reliability
- Timeliness
- Viability

One of the main purposes of using cultural indicators is to calculate the level of particular cultural concerns of individuals. Consequently, it is necessary that the cultural indicators should allow aggregation or disaggregation at different levels (for instance national, regional or community scale) for the purpose of analysis.

A cultural indicator should have the ability to be used for the same group or society at different points in time to measure and judge whether anticipated cultural outcomes in a particular framework have been promoted or have worsened. Furthermore, the cultural indicator should allow comparison between different groups, communities or societies that belong to different places (geographical regions or countries).

Simplicity is also a characteristic of a cultural indicator that allows its interpretation in a particular time or space. However, it does not mean that the basic theory behind it and the technique of its elaboration must be simple.

MCMS (1985:68) also suggest that as cultural indicators should be kept to a minimum, they should be devised adequately, so that the greatest quantity of information possible about the cultural concern to be measured can be interpreted. MCMS (1985:69) points out that cultural indicators should form a co-ordinated, consistent and interrelated whole and consequently be drawn up with a soundly constructed framework so that different data series may be associated and interrelated.

Cultural statistics are the basis for the elaboration of the cultural indicators arising from a cultural framework. As Pattanaik (1997:11) states, the evaluative framework based on functioning rather than commodities, can be used to abstract information, at least conceptually, from a large number of details to focus on a related small number of ends (their functioning). He (1997:11) argues that in practice, if the exercise is to remain tractable, attention must be restricted to the small number of functionings that are considered to be crucial and that can be captured through suitable indicators.

According to MCMS (1985:70) and Pfenniger (2004, cited in Madden, 2005:228), cultural indicators and the required data for their assessment should be available at the right moment to guide, evaluate and monitor cultural policy effectively. These cultural indicators should also be operational and must be stated in a realistic way instead of being ideal but unrealisable.

The International Federation of Arts Councils and Culture Agencies (IFACCA) (2005:10) has summarised and ranked the main attributes of a good [cultural] indicator based on the number of times they appear in the literature consulted (Table 4.13).

Attribute	No. of citations
Grounded in theory	9
Relevant (serve a practical or valued purpose)	6
Grounded in and/or linked to policy practice	5
Comparable across regions	5
Comparable across time periods	5
Measurable (able to be measured, and data available).	4
Easily understood	4
Unambiguous/clear	4
Able to be disaggregated by population subgroups	4
Consistent with purpose	4
Timely (up-to-date)	3
Measurable over time	3
Universal	2
Able to be benchmarked	2
Contextualised (presented with additional contextual information)	2
Revisable	2
Methodologically defensible	2
Reliable	1
Sensitive to cultural diversity	1
Realistic	1
Capture the essence of an issue	1
Designed through consultation	1
Trusted	1

• Sources: Belgian Government (2001), Brown and Corbett (1997), Chapman (2000), Cobb and Rixford (1998), Duxbury (2003:8-9), Fukuda-Parr (2001:2-3), Innes and Booher (2000), Lievesley (2001:377), Mercer (2004), Morton (1996:120), Pfniger (2004:4), Piganataro (2003), Sawicki (2002:25), Schuster (2001:5), Sharpe(1999:44), UNRISD and UNESCO (1997:8). (IFACCA, 2005:10)

IFACCA (2005:10) points out that the attributes are not necessarily mutually exclusive, and some rudimentary interpretation and grouping can be undertaken. Consequently, although according to the IFACCA (2005:10) the list cannot be taken as a scientific survey of opinion, this study uses this list as both providing a quick summary of recommendations made by indicator developers, and as highlighting the priorities perceived by these developers.

b. 2. Classification of Cultural Indicators

Madden (2005:224) proposes two main types of uses for cultural indicators: monitoring (observing cultural phenomena) and evaluation (measuring the efficacy of cultural policies and programmes). Brown and Corbett (1997, cited in Madden, 2005:224) categorise cultural indicators into a five-part typology of basic uses of [cultural] social indicators in policy:

- Description, for the sake of knowledge about society [and culture].

- Monitoring, to track outcomes that may require policy intervention.
- Setting goals, to establish quantifiable thresholds to be met within specific time-frames.
- Outcomes-based accountability, to hold managers, agencies, government and communities responsible for improving social well being and for meeting established goals.
- Evaluation, to determine which programmes and policies are effective (or destructive) and why.

As Madden (2005:227) points out, cultural indicators can be classified hierarchically based on the scale of detail at which they are applied. He (2005:227) classifies cultural indicators into the three categories of macro, meso and micro indicators. Madden (2007:227) describes macro indicators as indicators used for monitoring and evaluation, e.g. cultural indicators of development, and indicators of cultural rights. He (2005:227) considers meso indicators for use for regional or cross-agency policy monitoring and evaluation, e.g. indicators that measure outcomes of an arts council policy. Micro indicators are suggested for “agency programme monitoring and evaluation, e.g. indicators that measure outcomes of an arts event” (Madden, 2005:227).

b. 3. Ecotourism Related Cultural Indicators

Anticipated cultural outcomes as a framework for the development of ecotourism based on cultural education need to be evaluated by efficient cultural indicators with particular characteristics such as “measurability, data availability, data quality “(Duxbury, 2003:8) and “International comparability” (Breis, 1992:11). As Breis (1992:6) points out, the sequence for the creation of cultural indicators should be based on some type of constructed theory as a first attempt, and the subsequent search for the required data whether quantitative or non-quantitative.

According to Duxbury (2003:9), throughout the entire process of producing cultural indicators, all actions and decisions must be permeated by the question of intent and meaningfulness. Likewise, the main purpose and necessity for indicators must be clarified and the relevant subjects which need to be assessed must be explained through the constructed theory behind the process. Although cultural indicators must be comprehensive in order to consider all the different dimensions of cultural outcomes, these can be limited by some factors such as limitation of resources to do assessment and gaps be-

tween indicator statements/topics and data available to address or measure the cultural footprint of a phenomenon, such as ecotourism development.

As Pearce (cited in Travis, 1982:259) points out, “the social [cultural] impact of tourism will vary according to the differences between the visitors and the visited, whether in terms of numbers, race, culture, or social outlook.” Particularly in multi-cultural destinations, as Travis (1982:259) reveals, there may be several host cultures as well as several tourist cultures represented in one place, at one point in time, so it is not possible to see cultural impacts simply in the monolithic terms of host culture and visitor culture. As a result, in this case integration of the anticipated cultural indicators must be able to cover all valuable cultural productive activities and related goods and services. The latter are defined as items that are worthy of being presented at national or global level.

Furthermore, influenced by the existence of different cultures or communities (with various social structures in one destination), the suggested cultural framework and related indicators can be considered as parts of a policy to make a linkage between these various cultural systems and communities. However, to achieve this goal, some incompatible existing cultural heritage or social behavior might need to be adjusted, modified or completely ignored, particularly when these social-cultural behaviors are against human rights or cause conflict between communities.

b. 4. Cultural Indicators and Tourism Resources

Tourism resources are placed by Jafari and Ritchie (1981:17) into the three categories of natural, man-made and socio-cultural resources. To explain the man-made resources they (1981:17) argue that the term “sight-seeing” commonly refers to the observation of some man-made creation or building such as museums, churches, tall buildings, or other architectural masterpieces. In this view, the resources just refer to attractive buildings and associated landscapes as man-made tourism resources and other man-made resources such as food, textiles and handcrafts, which can be introduced as tangible cultural heritage, are neglected in this definition.

In terms of the socio-cultural resources of tourism, Jafari and Ritchie (1981:17) state that this category of resources represents the cultural heritage and social fabric of the peoples of the world, and includes both tangible (e.g. the man-made resources listed above) and intangible manifestations (e.g. cultural events and festivals). They (1981:17) introduce socio-cultural resources as the primary reasons for traveling. As a result of the

discussion above, tourism resources can be placed into the two categories of natural and social-cultural resources. In this view, social-cultural resources cover all man-made or tangible resources as well as intangible cultural activities and products.

This categorization of tourism resources can exert an influence on decision making related to the cultural framework and indicators for ecotourism development. Otherwise, the themes which are viewed as the cultural outcomes of ecotourism, being influenced by categorization of tourism resources as shown above, can be further sorted into the two areas of protection and development of intangible cultural heritage, and production, and consumption and conservation of tangible cultural capital. Following this, related cultural indicators can be classified into these two common groups. The first group can be used to qualify protection, development and presentation of the intangible cultural heritage (such as traditional festivals, concerts, and other celebrations) through participation of local and indigenous people in the development process. The second group of cultural indicators is viewed as the tools to assess qualitatively the production, consumption and protection of tangible cultural capital and products (such as vernacular architecture, handcrafts, food and textiles).

Ecotourism development based on cultural education aims to engage local and indigenous people in the protection of cultural heritage and in decision making related to the sustainable development process. As Reid et al (2004:625) reveal, it is important that deliberate measures such as cultural productive activities are carefully introduced to enable participants to take advantage of the opportunities brought by ecotourism. Without the careful implementation of such measures, which are viewed as part of the cultural activities related to ecotourism, the ecotourism industry might gradually lose the host communities' support. This, in turn, might threaten the sustainability of development in the future.

b. 5. Anticipated Cultural Indicators

This thesis attempts to present cultural indicators for the development of sustainable ecotourism (as a subsector of sustainable tourism) based on cultural education. According to the above discussion, data availability, measurability and international comparability are viewed as factors that form a framework for choosing these indicators.

As shown in Table 4.14, suggested cultural indicators can be categorized into three main types:

- The number of local and indigenous participants who participate in the development process including education, management, monitoring, protection of cultural heritage and economic activities (1a, 2a, 3a) (Table 4.14).
- The quality of tools, goods, services and places which are used or protected during the development process (1b, 1c, 3c, 4a, 5a, 6a, 7a) (Table 4.14).
- The economic benefits which participants earn from tourism development based on cultural education (3b) (Table 4.14).

Table 4.14: Proposed cultural indicators for development of ecotourism based on cultural education

Cultural Outcome	Ind	Title	Definition
Awareness of the local participants of their existing cultural heritage and the methods to protect this through the educational process	1a	Cultural education	The number of local people who participate in the educational process
	1b	Educational places	The areas, buildings and related infrastructure which are used for education
	1c	Educational tools and equipment	The tools and equipment that are used for education
Participation of local people in the cultural development process (programming, management and monitoring for the production, consumption and presentation of cultural products)	2a	Participation in cultural development process	The number of people who engage in the cultural development process including volunteer or employed participants
Culture-based development of economic systems that guarantee equal distribution of cultural capital and income among the local people	3a	Employment of local people	The number of local people employed in the culture-based economic system
	3b	GDPs ¹	Sustainable portion of GDP
	3c	Restored and protected cultural heritage (this indicator covers indicators 5a and 5a)	The quantity of the intangible and tangible cultural heritage that is protected or restored through development of tourism
Combination of ordinary tourism activities with compatible cultural activities	4a	Local-national or international cultural products	The quantity of local products which are combined with national or international products
Protection and restoration of tangible cultural heritage	5a	Restored tangible cultural heritage	The quantity of tangible cultural heritage that is protected or restored through development of tourism
Protection and restoration of intangible cultural heritage	6a	Products related to intangible cultural heritage	Cultural goods and services that contribute to restoration of intangible heritage
Tourist experience of authentic culture	7a	Authenticity	Original cultural products that are labeled as local products

1. GDPs is explained in the following section of this chapter

As demonstrated in Table 4.14, the anticipated cultural indicators attempt to assess quantitatively the engagement of local and indigenous people in the sustainable development process through assessing cultural activities and products related to cultural education. The integrated findings of these cultural indicators create a base for evaluating

policies and practices to be culturally appropriate through collecting and analyzing data related to each indicator.

c. Required Data Related to the Cultural Indicators

Table 4.15 shows a list of data which can be used to measure the cultural footprint of the sustainable development of tourism (in particular cultural education tourism which is viewed as the cultural dimension of ecotourism).

Indicator	Title	Required Data
1 a	Cultural education	D1. Creators In any one year, for people undertaking both paid and unpaid activity, the number, location, sex, age, ethnicity, cultural occupation/ activity type, hours worked, income, qualifications and training, plus whether this activity is a primary or secondary occupation (and if secondary, then primary occupation/ activity also).
		D2. Organizations In any financial year, by location: The number of organizations which are related to cultural education. Number of paid workers, by sex, age, and ethnicity, by type.
		D3. Participants The number of local and indigenous people who participate in cultural education process, by sex, age, ethnicity, by type of anticipated activity related to tourism development.
1b	Educational place(s)	D4. In any one year, the number of buildings and landscapes by area which are used for educational activities and services.
1c	Educational tools and equipment	D5. In any one year, the quantity of tools and equipment used in education process by type (magazines, books, media, Internet, radio).
2a	Participation in cultural development process	D6. In any one year, the number of local and indigenous people who engage in the educational development of tourism by sex, age, ethnicity, type of activity, level of education.
3a	Employment of the local people	In any financial year, by location, sex, age, ethnicity, level of education, activity:
		D7. The number of employed local and indigenous people by type of employment (full or part time).
		D8. The number of volunteers. D9. Annual income (\$ 000) by type of employment (full or part time).
3b	GDPs	D10. In any financial year, a part of GDPs which is generated by production and presentation of cultural products.
3c	Restored and protected tangible cultural heritage	D 11. In any one year, the quantity (area/number) of restored tangible cultural heritage by type (architecture, handcraft, etc.).
4a	Local-national or International cultural products	D12. In any one year, the number of produced cultural products which are combined with national or international products, by type (cultural events such as festivals, concerts; architecture; publications, sport tournaments, etc.), and by level (local, national or international).
6a	Products related to intangible cultural heritage	D13. In any one year, the number of products related to intangible cultural heritage by type (publication, music, performance arts, radio programmes).
7a	Authenticity	D14. In any one year, the quantity of cultural products which are locally produced and consumed, purchased or visited by visitors, by type (food, architecture, music, cultural events, etc.).

O'Mahony et al (2009:1135) introduce the achieving of sustainable tourism as an iterative process based on constant monitoring of impacts and the introduction of required preventive and / or corrective measures whenever necessary. As a result, they

(2009:1135) reveal that the role of data and information is central to both the implementation and monitoring of sustainable tourism development.

In order to appreciate and understand fully the major factors influencing the performance of cultural education through the sustainable development of ecotourism, this thesis offers a range of data to measure or to explain the various benefits or aspects of cultural education. These range from the education and awareness of the local and indigenous participants about their cultural capital and its potential, protection of cultural heritage, and strengthening of identity and development of cultural products related to the various economic, commercial and artistic opportunities (Table 4.15).

Table 4.15 shows data relating to all facets of cultural education, for instance, the creators (D1), related organizations (D2), participants in the development process (D3 and D6), cultural products (D13 and D14), required places, tools and equipment to be used for cultural education (D4 and D5), the activities that support progressing cultural education and development of tourism (D11 and D13) and the factors affecting cultural products to be improved, modified, justified or combined with imported cultural products (D12).

Integration of the data shown in Table 4.15 can be used to evaluate the progress towards achieving the anticipated cultural outcomes for the sustainable development of ecotourism. However, this cultural framework, its cultural outcomes, indicators and required data must be integrated with the ecological and economic frameworks and related indicators and data to create a comprehensive framework (Figure 4.8) which will have the ability to evaluate all dimensions of sustainability through development of tourism and its sub-sectors, such as ecotourism.

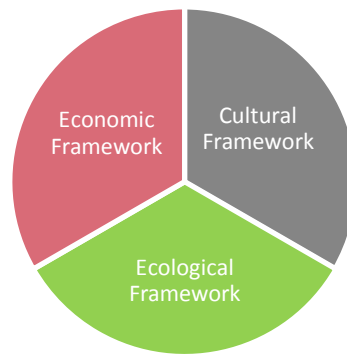


Figure 4.8: Comprehensive framework for sustainability and its segments

However, it is possible that in the integration of the cultural, ecological and economic frameworks, some of the indicators and related data will overlap each other. This can contribute to the creation of a smaller framework for the sustainable development of tourism and this process will be explored in the case study section of this thesis.

4.1.3. Economic Framework for Sustainable Development of Ecotourism

As previously shown in the model of sustainability (Chapter 2), the economy should be an area which has a social and ecological interaction with society and its surrounding environment. This model considers such an economy to be a multi-dimensional activity which is sensitive about the social-ecological footprint of its product and outcomes in terms of being socially appropriate and environmentally friendly. Arising from this social-ecological perspective, UNEP (2011:01) defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. However in this definition, the prefix of ‘green’ does not merely put emphasis on being ecologically friendly and it can be assumed to be the same as the prefix ‘sustainable’ for an economy.

Relying on the above definition of a green or sustainable economy and as discussed in the literature on sustainability and its proposed strategies for development (Chapter 2), the main outcomes of sustainable economic development can be categorised into the three areas of socio-cultural, ecological and economic outcomes which are linked together in a sustainable way.

4.1.3.1. Socio-Cultural Outcomes

The main social outcomes of sustainable economic development as proposed in the above cultural framework for ecotourism in this chapter, and as pointed out by research-

ers such as Costanza (2009:20), are opportunities for the involvement of local participants in activities that achieve economic growth and equal distribution of capitals among all components of a society. This can be viewed as a strategy that contributes to horizontal economic development through ecotourism.

The second cultural outcome for sustainable economic development relies on the strategy that results from the conservation of cultural heritage and that makes an opportunity for the people engaged to present their cultural products and capitals. This has been conceptualised in Table 4.10 as “development: arts, culture and heritage make a growing contribution to the economy”.

4.1.3.2. Environmental Outcome

Sustainable economic strategy relies on the idea that the conventional economic systems are the cause of environmental issues for human life through degradation of natural resources. Furthermore, these issues can be solved through changing social behaviours in terms of patterns of resource consumption.

As Organisation for Economic Development and Co-operation (OECD) (2008) reveals, two points are essential for achieving sustainable economic development. First: “economic growth alone is not enough to solve the world’s problem” (OECD, 2008: 2). Second: “the economic, social and environmental aspects of any action are interconnected” (OECD, 2008: 2). As a result, considering only one of these aspects at a time leads to ignoring other aspects of the sustainable environmental outcomes of an economic system. For example, if the environmental issues are assumed to be merely technical problems, the technical progress that attempts to reduce environmental impacts and increase human well being can cause other unrelated issues. For instance, as OECD (2008:3) argues, cars are now much more fuel-efficient than before, but air pollution is getting worse because so many more people have cars.

The main anticipated environmental outcome for sustainable economic development can be introduced as conservation of environmental resources through a social-economic educational process.

4.1.3.3. Economic Indicators

The shortage of efficient economic indicators can be seen as one of the critical issues for measuring the economic footprint of an activity (such as ecotourism) or a product (such as architecture) as being economically sustainable. As many researchers and related organisations such as NZCTU (2010:22) and UNEP (2011:26) have shown, the use of conventional economic indicators, such as GDP and other macroeconomic aggregates, can lead to a distorted picture of economic performance, particularly since such measures do not reflect the extent to which production and consumption activities may be drawing down natural capital.

As previously discussed in Chapter 2, many attempts have also been conducted to introduce economic indicators that have the ability to cover the social and ecological dimensions of sustainable economic development but the results contain potential weaknesses that must be justified. For instance, NZCTU (2010) proposes taxation as a strategy to monitor and control the environmental degradation caused by economic development. NZCTU (2010:21) suggests that polluters should face taxes on their emissions, including greenhouse gas emissions with the aim of them paying the costs of all significant “externalities” (side effects such as pollution and global warming). But, how the level of environmental pollution or degradation should be measured is a question still to be answered.

a. Measurement of Sustainable Portion of GDP

This thesis aims to help develop economic indicators that have the ability to calculate economic progress and can be comprehensive measures of well-being and environmentally sustainability. To achieve this aim, an economic indicator is needed that is as clear and appealing as GDP but more inclusive of other dimensions of progress, in particular the environmental and social aspects.

As discussed above, development of local and domestic products can be viewed as fundamental social-cultural priorities in a sustainable development strategy. This progress can clearly be economically measured using GDP. However, to measure the environmental impacts of these products by GDP, it is essential to integrate both gross domestic product and the cost that must be spent to conserve or restore the environment which is damaged during the process of development.

a. 1. Equation

This research proposes a method to calculate the sustainable portion of GDP (called here GDPs) that can be introduced as an economic indicator which measures both the social-economic benefits of producing local and domestic products and their environmental impacts in an integrated concept.

The method to measure GDPs involves five factors which are listed below, and then explained in detail:

- EF (gha): Ecological footprint of an activity or a product.
- GDP (\$): Earned GDP from this activity or product.
- EF1 (gha): Overshoot portion of EF of the product or activity relative to the available bio capacity
- E1 (GJ): Overshoot portion of the life cycle energy use of the product or activity relevant to the energy equivalent of bio capacity.
- CE1 (\$): The cost to generate the overshoot portion of the life cycle energy used through the use of renewable resources.

a. 2. Ecological Footprint (EF)

The ecological footprint (EF) measures the extent to which humanity is using nature's resources faster than they can regenerate. EFs are usually presented together with bio capacities (BCs), which measure the bio-productive supply. The EF of a given product or an activity is equal to the area (gha) needed to absorb the CO₂ emissions generated through using fossil fuel to produce its life cycle energy use (GJ).

- EF1

If an EF is larger than the available BC for a selected time period the EF/BC resource accounting results in a deficit or overshoot (EF1). A deficit occurs in the case where human resource extraction and waste generation exceed an ecosystem's ability to regenerate the extracted resources and to absorb the generated waste.

- E1 (GJ)

Overshoot portion of the life cycle energy use of the product or activity such that its CO₂ emissions are more than the related BC.

- **CE1 (\$)**

CE1 is assumed equal to the money needed to generate the overshoot portion of the life cycle energy used (E1) through the use of renewable resources. Its value depends on the level, type and cost of the available technology and renewable resources. As a result, CE1 can be different from one location to another or from region to region or country to country.

The following equation can be used to evaluate the sustainable portion of GDP (GDPs):

$$\text{GDPs} = \text{GDP} - \text{CE1}$$

b. The Main Characteristics of GDPs

GDPs is introduced here as a multi-dimensional indicator that has the ability to measure and evaluate the socio-economic and environmental success of human products and activities as being sustainable.

b. 1. Social-Cultural Characteristics

Making opportunities for local and indigenous people to produce and present their cultural capitals and products is one of the fundamental cultural outcomes for the sustainable development of an activity such as ecotourism. Since GDPs emphasises the development of local and domestic products, it can be determined as a social-economic indicator that contributes to the evaluation of success in achieving this cultural outcome.

b. 2. Environmental Characteristics

GDPs is an economic indicator that is sensitive to the environmental impacts of human products and activities. Integration of EF and economic development in GDPs allows it to be considered as a social-economic indicator as well as an ecological indicator.

GDPs addresses the amount of GDP that must be spent to conserve and restore damaged environmental resources. It can contribute to the more accurate accounting of other economic indicators such as Goods, Services Tax (GST).

4.1.4. Cultural Footprint of Ecotourism

4.1.4.1. Definition

The thesis introduces ecotourism as a sustainable phenomenon that aims to conserve the natural and cultural heritage of its host societies and engage them in social-economic

development through an educational process. The anticipated outcomes of ecotourism are linked together, influenced by the strategy for sustainable development in a way so that achieving each of them contributes to the others, all being set under the umbrella of sustainability.

Figure 4.9 shows the relationship between the cultural changes to the host society caused by the development of ecotourism and its following environmental and economic changes. Based on its anticipated cultural outcomes, the cultural footprint (CF) of ecotourism can be conceptualized as the influences exerted by ecotourism on a given host society that change its attitudes to existing cultural and natural heritage and capital, and that develops cultural communication between it and its visitors.

Since the economic development of ecotourism is introduced as a social-economic activity that is environmentally sensitive as well, the cultural changes of the host society can direct the economic system toward sustainable economic strategies.

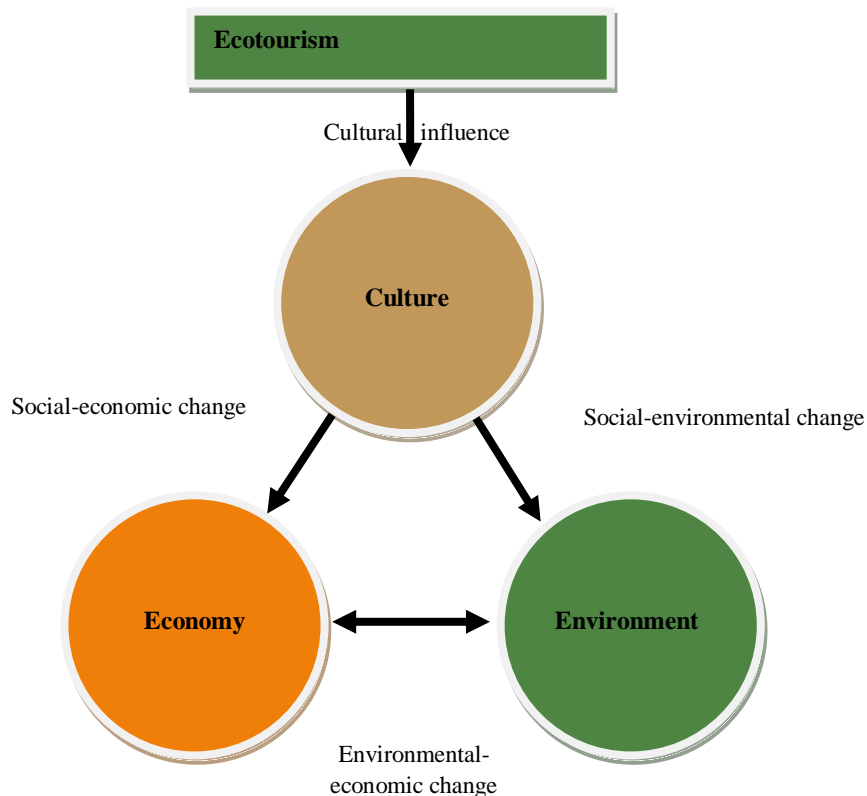


Figure 4.9: Relationship between ecotourism, culture of the host society, environment and economic system

4.1.4.2. CF-Model

Figure 4.10 shows a proposed model that can be used to explore the quantitative interaction between the cultural, environmental and economic changes caused by ecotourism in its host societies. In this model (Figure 4.10), each of the cultural, environmental and economic indicators (proposed in the comprehensive framework) is set on one of the apexes. In this model, cultural indicators determine and measure the quantity of the cultural products and activities (for example producing local foodstuffs) that are anticipated as cultural productive activities in the cultural framework. These cultural indicators determine a part of the CF of ecotourism development.

In this model, the environmental impacts of the cultural products and activities are calculated by using the related ecological indicators such as EF. The EF of the cultural products and activities contributed by ecotourism, determines whether these cultural products and activities are environmentally sustainable or not. Evaluation of the EF can be conducted through comparison between the measured EF and fair EF (Ideal EF for sustainable living) for each product and activity. Likewise two different products (for example organic and conventional foods) or activities (for example walking and golfing) that are offered by ecotourism can be ecologically compared with each other by making comparison between their EFs.

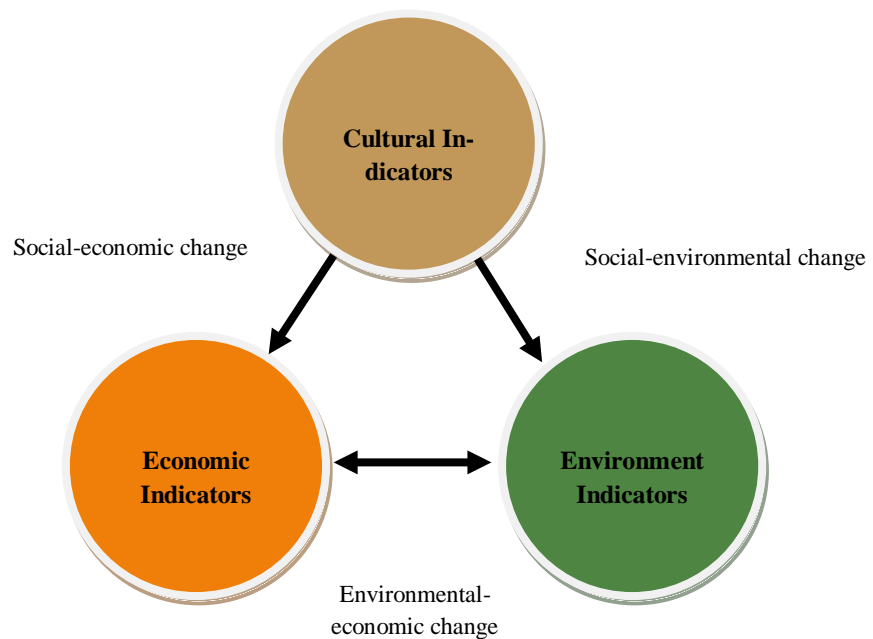


Figure 4.10: A model to evaluate interaction between cultural, environmental and economic changes caused by ecotourism development.

The social-economic footprint of the cultural products and activities can be measured by using economic indicators such as GDPs. Since the GDPs of each product or activity is influenced by its EF, if a cultural product or an activity contributes to reducing the EF of ecotourism, this activity contributes to increasing GDPs.

Figure 4.11 illustrates an area the boundaries of which are determined by: the quantity of the cultural products and activities developed through ecotourism; the reduced or increased (R/I) portion of EF influenced by these products and activities; and (R/I) portion of GDPs caused by them. This area can be considered as the cultural footprint (CF) of these products or activities. Thus, the total CF of ecotourism development can be illustrated as an area in which its apexes are the total quantity, and the reduced or increased portions of EF and GDPs caused by its cultural products and activities (Figure 4.11).

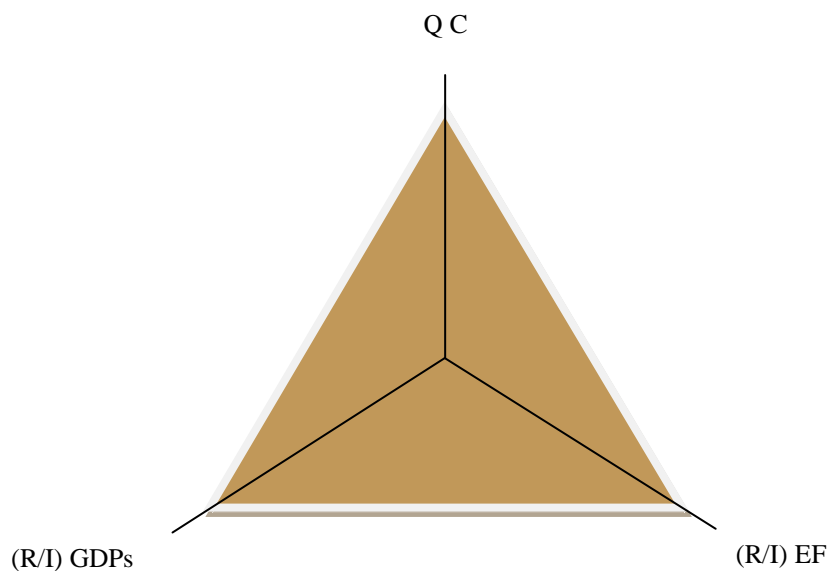


Figure 4.11: Cultural footprint (CF) model

In Figure 4.11:

Q C: Quantity of the cultural products or activities.

(R/I) EF: Reduced or increased portion of EF influenced by Q C.

(R/I) GDPs: Reduced or increased portion of GDPs influenced by Q C.

a. Measurement of the (R/I) EF of Cultural Products

The calculation of (R/I) EF of cultural products is based on the following factors:

EF: Total ecological footprint of all cultural and conventional products. The EF determines the present ecological footprint of all cultural and conventional products.

EF1: the ecological footprint of ecotourism products with the assumption that all are conventional.

The difference between EF1 and EF is equal to the portion of EF that is reduced or increased by using cultural products.

$$(R/I) EF = EF - EF1$$

The (R/I) GDPs of ecotourism products can be measured by using the same method explained above.

b. Measurement of the (R/I) EF of Activities

In this study the EFs of ecotourism activities are compared with the fair EF of sustainable living related to each type of activity. According to WWF Living Planet Report (2012:12), WWF Living Planet Report (2010:74), and Vale and Vale (2009:358), in 2007, the total fair EF of sustainable living is 1.85 gha/ capita that covers all human life, activities and products. In this thesis the fair EF of sustainable living related to each category of ecotourism products and activities is calculated as a portion of the total fair EF of sustainable living (1.85 gha/ capita) proposed by WWF Living Planet Report (2010 and 2012).

Using the fair EF for sustainable living as a benchmark, ecotourism activities can be categorized by their EF into two types of activities with large (Type 1) and small EFs (Type 2). Measurement of (R/I) EF as influenced by ecotourism activities involves the following factors:

- EF= Ecological footprint of ecotourism activities including activities with large and small EFs
- EF1= Ecological footprint of ecotourism activities with the assumption that all activities are Type 2.

$$R/I EF = EF - EF1$$

The result of this equation addresses the ecotourism activities that should be considered and those that must be justified or ignored. The difference between the present EF of an activity or product and ideal (fair) EF indicates the overshoot portion of the present ecological footprint.

$$\text{EF (present/ assumed)} - \text{Ideal EF} = \text{Overshoot portion of the EF (present/ assumed)}$$

c. Measurement of the (R/I) GDPs of Ecotourism Activities

The (R/I) GDPs of ecotourism activities can be measured using the same method as mentioned above through the following equation:

$$(\text{R/ I}) \text{ GDPs} = \text{GDPs1} - \text{GDPs}$$

In this equation:

- (R/I) GDPs: Reduced or increased portion of GDPs influenced by Type 2 activities
- GDPs = sustainable portion of GDP earned by ecotourism activities including Type 1 and 2 activities.
- GDPs1= Sustainable portion of GDP activities with the assumption that all activities are Type 2.

The result of the equation shows the reduced portion of GDPs as influenced by Type 1 activities.

d. Example

The CF model can be used for comparing the CFs of different projects, products or activities by setting their CFs in one model as shown in Figure 4.12. Figure 4.12 shows an example of using the CF model to compare the CFs of two different ecotourism activities (for instance walking and golfing).

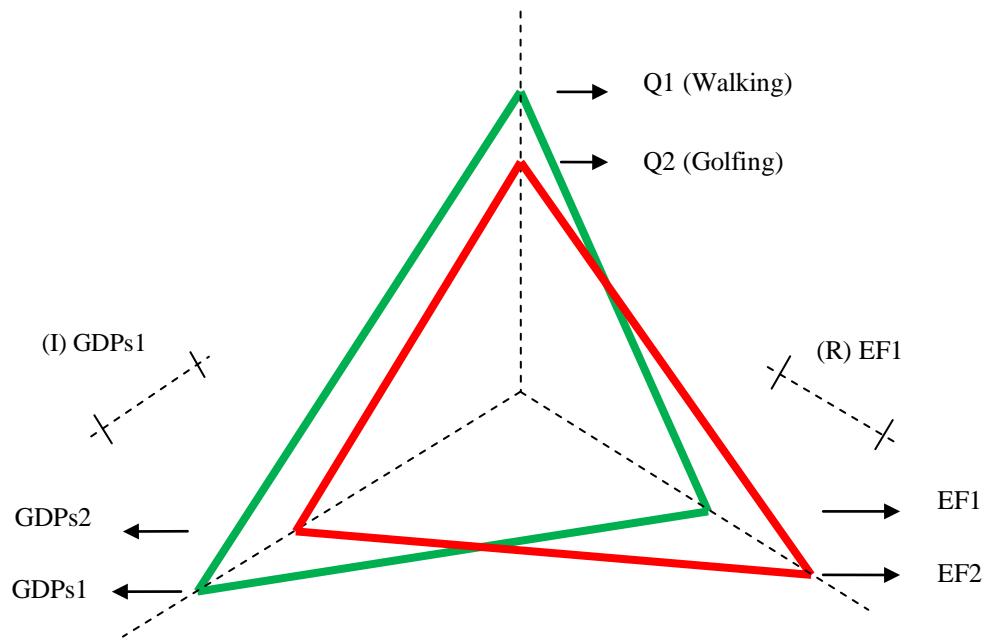


Figure 4.12: CF model used for comparison between the CFs of two different Ecotourism activities

In this model (Figure 4.12):

- Q1: Quantity of walking (number of visitors who walk).
- Q2: Quantity of golfing (number of visitors who play golf).
- EF1: Ecological footprint of walking /visitor.
- EF2: Ecological footprint of golfing /visitor.
- GDPs1: Portion of GDPs earned by walking
- GDPs: Portion of GDPs earned by golfing
- (I) GDPs1: Increase in portion of GDPs by walking as an activity.
- (R) EF1: Reduced portion of total EF influenced by walking as an activity.
- Red area: CF area of golfing
- Green area: CF area of walking.

As illustrated in Figure 4.12 the number of visitors who choose walking as one of their activities (Q1) is more than the number of visitor who play golf (Q2). In addition as shown in Figure4.12 the total EF of visitors related to walking is smaller than the total EF of visitors who play golf.

Furthermore the GDPs related to walking is more than the GDPs related to golf. Thus in this example in comparison with the CF of golfing, walking as a social behavior attracts more visitors, has less EF and more GDPs. Consequently, comparison between the CFs of walking and golfing results in demonstrating that walking is more culturally appro-

priate, because more people do it, ($Q1 > Q2$), it is more ecologically sensitive ($EF1 < EF2$) and more economically viable ($GDPs1 > GDPs2$).

This research uses the CF model as a tool to make a link between the social-cultural behaviors that are offered to visitors through ecotourism and their environmental and economic footprints. The CF model can help in making the decision as to which products and activities must be developed, further justified or ignored through ecotourism development. The CF model can be considered as a holistic framework in which the environmental, cultural and economic frameworks for the development of ecotourism are set.

4.2. Comprehensive Framework for Sustainable Development of Architecture

This section presents a multi-dimensional framework to determine the main environmental, cultural and economic outcomes for a sustainable architecture (in particular accommodation services) through the sustainable development of ecotourism. This study introduces some productive activities that can contribute to achieving the anticipated outcomes for sustainable architecture.

In this research, as explained in Chapter 2, sustainable architecture is explained as being part of a natural organism which has an ecological relationship with its surroundings that in turn exert an influence on the supply of renewable materials and energies for construction and other requirements, such as heating, cooling and lighting.

Architecture is one of the ecotourism products and its main strategy for development is as a segment of the holistic framework for ecotourism as explained in this Chapter. In addition, the main anticipated outcomes for sustainable architecture can be similar to the ecotourism outcomes explained in the framework, but particular activities to achieve these outcomes are related to the field of architecture.

Arising from the literature on sustainability, ecotourism and its framework for development, and the main profiles of sustainable architecture (Chapter 2), the thesis suggests a range of environmental, cultural and economic outcomes, their related produc-

tive activities, indicators and required data which can be used as a tool to evaluate the sustainability of ecotourism architecture.

4.2.1. Environmental Framework for Sustainable Development of Ecotourism Architecture

The following part of this section explains the main components of the proposed environmental framework for sustainable architecture used in the development of ecotourism. It contains the anticipated environmental outcomes, related productive activities, ecological indicators and required data.

4.2.1.1. Environmental Outcomes

Based on the role of environment in the strong model of sustainability (Chapter 2), the fundamental forecasted environmental outcome for sustainable architecture related to ecotourism can be thought of as conservation of environmental resources (Table 4.16).

Table 4.16: The framework for sustainable architecture (outcomes and activities)	
Anticipated outcomes for ecotourism architecture (accommodation services)	
Environmental outcomes	Productive activities
Conservation of natural resources	Using minimal resources and optimizing size of spaces used for accommodation services
	Using some parts of open areas to generate food, energy and some required materials and presenting these activities to ecotourists
	Horizontal distribution of accommodation services
	Development of accommodation services at the local level
	Use existing buildings for accommodation services – these might be repaired or made to match with sustainable patterns of architecture
	Using renewable resources for heating and cooling
	Using local and durable materials for construction with lowest EF
	Using local manufacturers and equipment made from natural products with low EF in interior spaces

Table 4.16 shows a range of productive activities that can contribute to architecture to achieve this outcome. Since environmental conservation has been explained as a social-ecological activity that can be conducted through the use of available technologies, the anticipated activities shown in Table 4.16 have social-ecological and technical-ecological characteristics. All these activities can be conducted in a community based process that attempts to engage local and indigenous people (as components of the organism) in the conservation process. This will thereby make them aware of the impact

of their behavior on the environment and the benefits of using renewable resources to reduce these impacts through an educational process.

Indeed, when this approach is applied to the sustainable development of architecture, as Ding (2008:463) reveals, it involves the efficient allocation of resources, minimum energy consumption, low embodied energy intensity in building materials and construction processes, reuse and recycling, using renewable resources of energy and materials and changing unsustainable socio-cultural patterns of materials, energies and spaces consumption.

4.2.1.2. Ecological Indicators

Table 4.17 shows a range of proposed social-ecological indicators that can be divided into two types of indicators focused on the pattern of using spaces at different scales (E 1-4), and indicators focused on use of materials and energy resources (E 5-7). In Table 4.17, the EFs of materials and manufactures (E 5-7) are used as separate ecological indicators from the other indicators (E 1-4). However, it should be remembered that indicators E 1-4 arise from policies aimed at reducing the EF of all human activities and products, such as the patterns of use of spaces, materials and energy resources.

Indicator	Description	Unit
E 1	The area used as accommodation services	m ² /visitor
E 2	Public open air area used for generation of food, energy and some required materials.	m ² /visitor
E 3	Distance between accommodation services.	km
E 4	Modified or repaired buildings used for accommodation services	m ² /visitor
E 5	Renewable resources used to generate energy	GJ
E 6	EF of local materials used to build accommodation services	GJ/gha
E 7	EF of manufactured components produced locally	GJ/gha

4.2.1.3. Required Data

The quantity and quality (refurbished and new) of architectural spaces at the different scales of region, site and building can be considered as forming the required data related to indicators E 1-4. Moreover the quantity and types of materials and manufactures used form the required data to measure EFs related to indicators E 5-7.

4.2.2. Cultural Framework for Sustainable Architecture Used in Ecotourism Development

4.2.2.1. Anticipated Cultural Outcomes for Sustainable Architecture

As shown in Table 4.18, this study anticipates some cultural outcomes for architecture that can be used as tools to explore its cultural footprint on host destinations through the sustainable development of ecotourism. The main cultural outcomes can be introduced as engagement of educated local and indigenous people in protection and presentation of their cultural capitals, and development of cultural interaction between visitors and the host communities (Table 4.18).

Table 4.18: Forecasted cultural outcomes for sustainable architecture and its related productive activities.

Cultural outcomes	Productive activities
<ul style="list-style-type: none"> • Changing attitudes of local and indigenous people to their cultural capitals including vernacular architecture. Making valuable local products which are also environmentally compatible and can be used as goods and services by visitors • Development of cultural relationships between host communities and visitors • Opportunity for visitors to be familiar with a part of host culture through using its architecture and related products • Opportunity for host people to present their intangible cultural products including architecture and its related components. 	Modifying and justifying the existing buildings to avoid unsustainable and unnecessary development of services
	Development of types of accommodation services which contribute to close relationships between host people and visitors
	Equal distribution of accommodation services in any project to avoid massing of capitals in a particular place and depression of other areas.
	Avoiding luxuries and fashions and giving more focus and attention to local values in architecture.
	Using local and available technologies for construction.
	Engagement of local communities, organizations and people in the processes related to accommodation services (planning, management, investment, and construction etc).

Table 4.18 shows a range of productive activities that can contribute to achieving the latter cultural outcomes. However, some of the productive activities introduced in Table 4.16 can also be viewed as social-cultural productive activities.

4.2.2.2. Cultural Indicators

This section proposes cultural indicators which are classified into the two types of macro and micro indicators to evaluate the sustainability of architecture (in particular accommodation services) through the sustainable development of ecotourism. This classification arises from the essential characteristics of the cultural indicators explained above.

Table 4.19 determines the cultural indicators to be used for the evaluation of architecture related activities (shown in Table 4.18) as being culturally sustainable.

Table 4.19: Cultural indicators to evaluate culturally appropriate architecture.

Cultural Indicator	Description	Unit	Level/Scale
C1	Modified or new buildings used for accommodation services.	m ² /visitor	Region
C2	Farm stay/ home stay accommodation services	m ² /visitor	Region
C3	Distances between accommodation services	km	Region
C4	Proportion of built up land (accommodation) to public open air areas.	%	Site
C5	Public open air areas as multi-functional spaces for cultural events	m ² /visitor	Architecture/ site/region
C6	Locally constructed building(s) used as accommodation services.	m ² /visitor	Architecture/ Site/region
C7	Types of materials used for construction	m ³ /visitor of different types	Architecture/ Site/region
C8	The number of local communities, organizations and people engaged in the processes related to accommodation services (planning, management, investment, and construction).	number in dif- ferent categories	Architecture/ site/region

As shown in Table 4.19, these objective cultural indicators can be classified, according to the level of detail at which they are applied, into three scale types: macro (regional-C1, C2, C3), micro (one specific site-C4), and macro - micro (composite indicators-C5, C6, C7).

This thesis attempts to use objective cultural indicators which are measurable. Moreover, these indicators must be comparable for use in different places with different cultural and environmental circumstances. It should be remembered that most of the environmental indicators which are used to evaluate architecture as being environmentally sensitive can also be viewed as cultural indicators to evaluate its cultural footprint.

4.2.2.3. Required Data

Table 4.20 shows a range of required data to be used for evaluation of the CF of architecture (in particular accommodation services) through the sustainable development of ecotourism.

Table 4.20 : Required data for evaluation of the CF of architecture

Required Data	Description	unit	Level
C-D1	The area of modified or new buildings used as accommodation services at the scale of region or site	m ²	Macro
C-D2	The number of visitors per year at the scale of region or site	Visitor/year	Macro
C-D3	The number of visitors per year at the scale architecture	Visitor/year	Micro
C-D4	Types of accommodation services at the scale of region or site or community.	m ² /type	Macro
C-D5	Distance between accommodation services at the scale of region or site or community	km	Macro
C-D6	Multi-functional spaces (closed and open air) used for cultural events at the scale of region or site or community	m ²	Macro
C-D7	Multi-functional spaces (closed and open air) used for cultural events at the scale of architecture	m ²	Micro
C-D8	Buildings which are constructed by using local technologies at the scale of region or site or community	m ²	Macro
C-D9	Buildings which are constructed by using local technologies at the scale of architecture.	m ²	Macro
C-D10	Types of main materials used for construction at the scale of region or site or community	m ³ /type	Micro
C-D10	Types of the main materials used for construction at the scale of architecture.	m ³ /type	Micro
C-D11	Number of local communities, organizations and people engaged in the processes related to accommodation services (planning, management, investment, and construction) at the scale of region or site or community.	Number/ category	Micro
C-D12	The number of local communities, organizations and people engaged in the processes related to accommodation services (planning, management, investment, and construction) at the scale of architecture.	Number/ category	Macro

As shown in Table 4.20, the required data can be categorised into the two types of macro and micro scale data. The macro scale data refers to the cultural footprint of the development policies at the scale of region or community or site, and micro scale data refers to the cultural footprint of a building at the scale of an individual unit. Since regional dimensions of the cultural footprint refer to the participation of local people (with similar cultural backgrounds) in the sustainable development process through engagement in forecasted cultural activities (cited in Table 4.18), macro scale data can be used to measure the quantity of this engagement at the scale of a region, a community or a site.

The cultural footprint of a building refers to the interaction between architecture as a micro-organism and its surrounding environment, in particular through using materials and sources of energy as influenced by the dominant cultural system. Micro scale data can be used to measure the cultural footprint of architecture at the scale of a building.

As a result, the combination of the required macro and micro data can be considered as a tool for the comprehensive measurement of the cultural footprint of architecture.

4.2.3. Economic Framework

This section presents an economic framework for architecture as used in the sustainable development of ecotourism. Since architecture is one of the ecotourism products, its economic policies and principles are dominated by the social-economic strategies of ecotourism. Furthermore, in this case, the main environmental and social outcomes for the economic development of architecture can be viewed as the same as those anticipated for the economic development of ecotourism, but in an area limited to architecture and its profiles.

4.2.3.1. Environmental Outcomes and Activities

The main environmental outcome for the economic development of architecture is introduced as being the same as that anticipated for ecotourism, as demonstrated in section 4.1.3.2. As shown in Table 4.21, the economic productive activities that must be accomplished in the field of architecture can be an economic contribution to the environmental activities forecasted for architecture in Table 4.16.

Table 4.21: Environmental outcome and related productive activities for economic development of architecture

Environmental outcome	Productive activities
Conservation of the environmental resources	Economic contribution to: Using minimal resources and optimizing size of spaces used for accommodation services; Using some parts of open areas to generate food, energy and some required materials and presenting these activities to Eco-tourists; Horizontal distribution of accommodation services; Development of accommodation services at the local level; Use existing buildings for accommodation services – these might be repaired or made to match with sustainable patterns of architecture; Using renewable resources for heating and cooling; Using local and durable materials for construction with lowest EF; Using local manufacturers and equipment which is made from natural products with low EF in interior spaces.

4.2.3.2. Indicator

Since GDPs has been introduced as an economic indicator that is involved in the ecological and social dimensions of development, this research suggests using GDPs as a fundamental economic indicator for the evaluation of the economic-ecological impacts of architecture used in ecotourism development.

4.2.3.3. Cultural Outcome and Activities

The main forecasted social-cultural outcome for the economic development of architecture is the same as the outcomes introduced in Table 4.18. Moreover its forecasted productive activities can be explained as an economic contribution to the anticipated activities, as explained in Table 18.

4.2.3.4. Indicators

GDPs and employment of local people are the two main economic indicators that are proposed for evaluating the social dimension of the economic development of architecture through ecotourism. However, GDPs also has the ability to cover the second indicator (employment), because contribution to the development of local products also makes opportunities for local people to be engaged in the economic development process.

4.2.4. CF of Architecture

The CF of architecture at the different scales of region, site and building can be evaluated and determined though using the CF model introduced in this chapter the CF model allows this research to make a link between the cultural, ecological and economic profiles of an architecture that can contribute to sustainable development through ecotourism.

The description of the comprehensive framework and its derivation has unavoidably been quite complex and highly theoretical. Chapters 5 and 6 will demonstrate its use for evaluation of an objective case study. This will clarify how the framework operates in practice.

4.3. Chapter 4: Summary

Chapter 4 presents the comprehensive framework for the sustainable development of ecotourism and its architecture that is a pivotal part of the methodology as explained in Chapter 3. The aim of the framework is to introduce a method that can solve the methodological problems discussed in Chapter 3 and contribute to answering the research questions in Chapter 2.

The comprehensive framework is in two sections: the framework for ecotourism; and the framework for architecture (Figure 4.13). In response to the methodological problems discussed, the comprehensive framework integrates the three sub-sections of the ecological, cultural and economic frameworks for both ecotourism and architecture in the related cultural footprint (CF) model (Figure 4.13).

The framework indicates five ecological outcomes for the development of ecotourism (Table 4.2). The outcomes emphasize awareness of local and indigenous people about their environmental heritage and capital through an educational process, and subsequent engagement of such people in the development of ecotourism (Table 4.2). Furthermore, environmental conservation through using renewable resources to generate the energy used by tourism is another anticipated goal for the sustainable development of ecotourism.

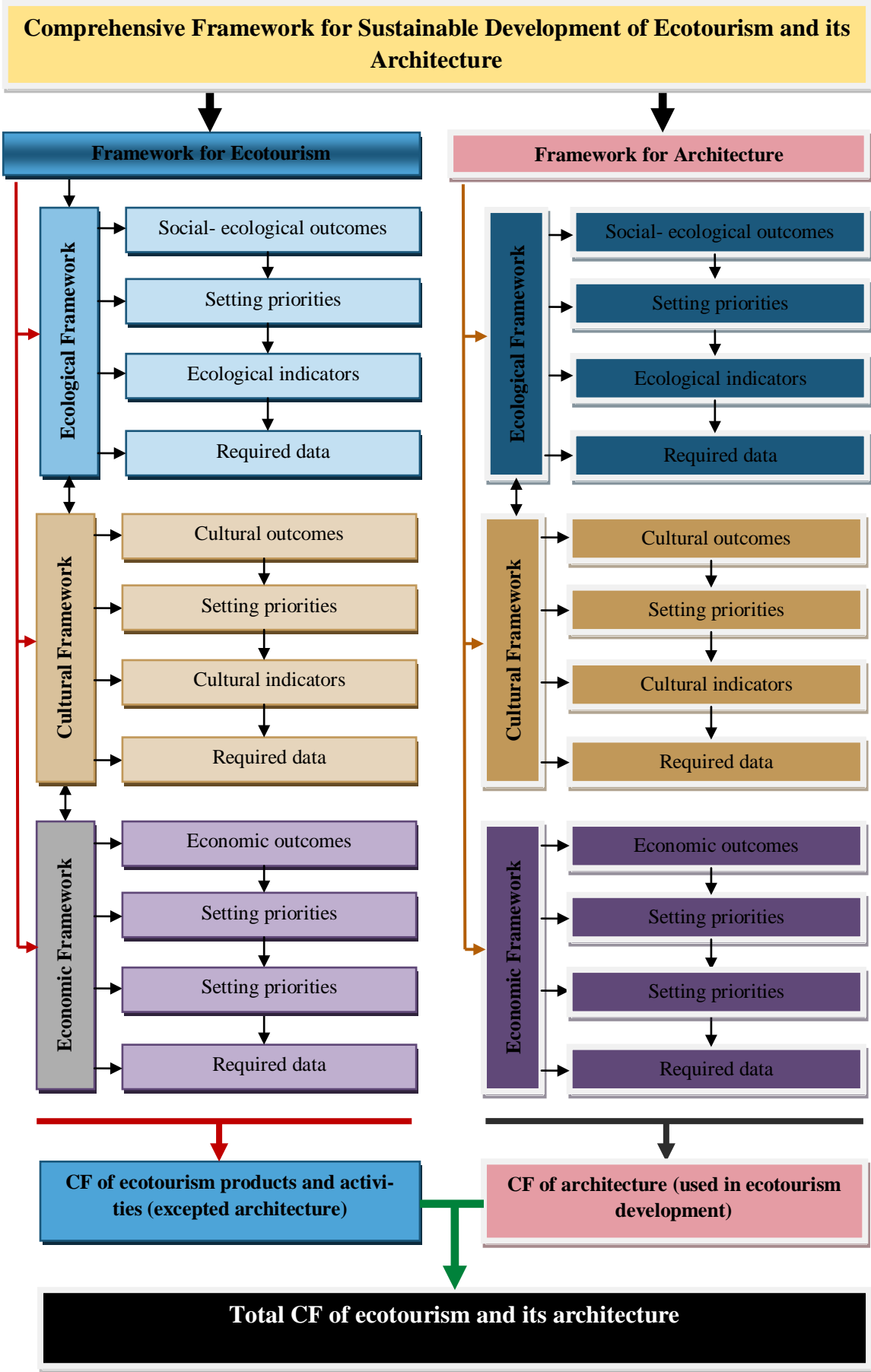


Figure 4.13: Structure of the compressive framework proposed through Chapter 4.

Table 4.12 shows the eight anticipated cultural outcomes for the sustainable development of tourism that can be also applied to ecotourism and its architecture. These outcomes can be conceptualised as engagement of the host society in the conservation and development process of their cultural heritage and capitals through an educational process that also economically benefits them and ecologically protects their environment.

The comprehensive framework considers the economic development of ecotourism and its architecture as a social-ecological economic phenomenon. In this approach, the main policies for economic development rely on sustainability principles and policies. The framework indicates the social-cultural outcomes for the sustainable economic development of ecotourism and architecture as making opportunity for the engagement of the host societies in horizontal economic development, while the development process follows the sustainability strategies.

As demonstrated in Table 4.2, five priorities are proposed for achieving the ecological outcomes for the sustainable development of ecotourism. These include social ecological policies (e.g. engagement of people as well as all related organizations in environmental education) and social-economic strategies (e.g. employment of local and indigenous participants in the development process as employed or volunteer staff). These priorities aim to inform and benefit people through development of ecotourism as being ecologically sustainable (Table 4.2).

The framework introduces seven productive activities for achieving the forecasted ecological outcomes for architecture used in ecotourism development (Table 4.16). Conceptually, these are strategies for using materials, energy resources and spaces created, and management and organisation of services related to ecotourism architecture at regional and local scales (Table 4.16).

In this chapter the cultural priorities are viewed as the development of products and activities that contribute to achieving the forecasted cultural outcomes for the sustainable development of ecotourism. These can be summarised as:

- Development of cultural education and its related educational tools, equipment and spaces;

- Restoration of cultural heritage and development of cultural capitals and products in a way that ecologically and economically benefits the host society ;
- Protection of host authenticity.

The six cultural priorities proposed for the development of architecture through ecotourism (Table 4.18) can be summarised as using types of architecture and related services that contribute to:

- Restoring the cultural heritage;
- Cultural interaction between host society and visitors;
- Avoiding luxuries and fusions;
- Using available technologies;
- Democratic engagement of local people in the development process.

Economic priorities proposed for ecotourism and its architecture are considered the same as the ecological and cultural productive activities that economically benefit the host destinations of ecotourism in a sustainable way.

Chapter 4 presents the ecological indicators for the development of ecotourism (Table 4.3) and its architecture (Table 4.17). In terms of ecotourism, the ecological indicators include: the number of people who engage in the sustainable development of ecotourism through an educational process; and, the EF of products and activities produced/ consumed / conducted in relation to ecotourism (Table 4.3).

The ecological indicators for evaluation of architecture can be categorised into the three categories of quality (e.g. using refurbished buildings), quantity (e.g. the area used as accommodation) and the EF of the architecture involved (Table 4.17).

Mahrahan and Vale (2010) and O'Connor (2009) reveal that the EFs of some tourism products and activities (such as waste and water consumption) are small, whereas the EFs of transportation, food, accommodation services and tourism activities form the major part of the overall EF. Consequently these four categories have been chosen for evaluation using the comprehensive framework. The EFs of these categories are also used as the main ecological indicators to evaluate the three case studies, introduced in previous chapters, as being ecologically sustainable.

The cultural indicators for development of ecotourism (Table 4.14) and its architecture (4.19) can be summarised as the priorities proposed for both ecotourism and architecture. However, as will be discussed in the conclusion, some indicators can be covered by other indicators to shorten the list and to solve shortcomings in the related data.

Due to a deficit of efficient economic indicators for the sustainable development of ecotourism and its products, this thesis introduces GDPs as a new economic indicator. The GDPs aims to connect the economic development of ecotourism and architecture to the ecological and the social indicators proposed for these categories as being economically sustainable.

The framework proposes the CF model as an original system to analyse the cultural footprint of ecotourism and its products and activities. The CF model indicates the environmental influences exerted by ecotourism and its products and activities on a given host destination. The model can also be a tool to compare the current ecological, social and economic circumstances of an ecotourism project and its sustainable pattern (ideal model). In addition the CF model can be used to compare different ecotourism projects in terms of being sustainable. Furthermore, it can be used to compare the cultural footprint of a project at different times.

The framework thus answers the research question “What are the main characteristics of an efficient strategy for the sustainable development of ecotourism and its products, such as architecture?” (Chapter 2, section 2.6.1.1) as:

- A holistic approach to sustainable development that covers all ecological, cultural and economic dimensions of ecotourism and its architecture as being sustainable.
- Proposing ecological, cultural, economic outcomes, priorities, related indicators and required data for evaluation of ecotourism and its architecture as being sustainable.

In response to the research question “What are the relationships between the anticipated outcomes for ecotourism and its architecture and how are they linked to each other?” (Chapter 2, section 2.6.1.2) it could be said that:

The anticipated outcomes are linked together through sustainable policies and strategies. This means that all the anticipated outcomes simultaneously must be ecologically sensitive, culturally appropriate and economically sustainable.

The framework answers the research question “what are the main priorities for the development of ecotourism and its related architecture that can contribute to achieving their forecasted outcomes in a sustainable way?” through proposing the priorities discussed in this Chapter. Other research questions will be answered through testing the CF model and the results (Chapters 6 and 7).

Chapter 5: First Case Study – Otago Central Rail Trail (OCRT), Otago, New Zealand

5.1. Introduction

The thesis results are presented in Chapters 5 and 6. This chapter describes the case study of the ‘The Otago Central Rail Trail (OCRT)’ introduced in the New Zealand Tourism Strategy (NZTS) 2015 as a successful example of sustainable tourism development. Since the OCRT crosses many rural and urban places and their adjacent areas with different environmental, cultural and economic characteristics, it can be considered as the integration of both rural and urban ecotourism projects. This chapter investigates the impacts of the OCRT as a tourism project (managed by the OCRT community and other related organizations) and its related architecture on cultural heritage, local economic systems and natural resources at regional scale. The investigation is conducted through using the comprehensive framework proposed for the sustainable development of ecotourism and its products (including architecture) and activities (see Chapter 4).

This chapter responds to four research questions (Questions 2.6.1.4 to 2.6.1.7) introduced in Chapter 2. Through answering these how the proposed priorities for the sustainable development of ecotourism and its architecture influence each other and the host society at the regional scale ecologically, socially and economically, will be clarified. Chapter 5 also sets out how these influences can be measured and evaluated through using the comprehensive framework introduced in Chapter 4.

5.2. Otago Central Rail Trail (OCRT) – Background

Originally the Otago Central Railway that is located in the South Island of New Zealand (Figure 5.1) was constructed to transport gold out from the booming Central Otago goldfields of the late 1800s and into the bustling city of Dunedin (Graham, 2009:3). In the forty years it took to complete the railway, over 60 bridges and 3 tunnels were built as part of the railway between Middlemarch and Clyde. According to Burns and Corbet (2007:62) the railway closed in 1990, at a time when the rural community was in a state

of stagnation. Graham (2009:4) points out that through the early 1990s, towns in Central Otago as in other rural areas in New Zealand lost many of their services and suffered from a reducing population, as banks and post offices closed and many businesses moved away. However, as explained by Burns and Corbet (2007:62) some local people viewed the closed railway line as an opportunity and potential attraction for developing the tourism industry in Central Otago.

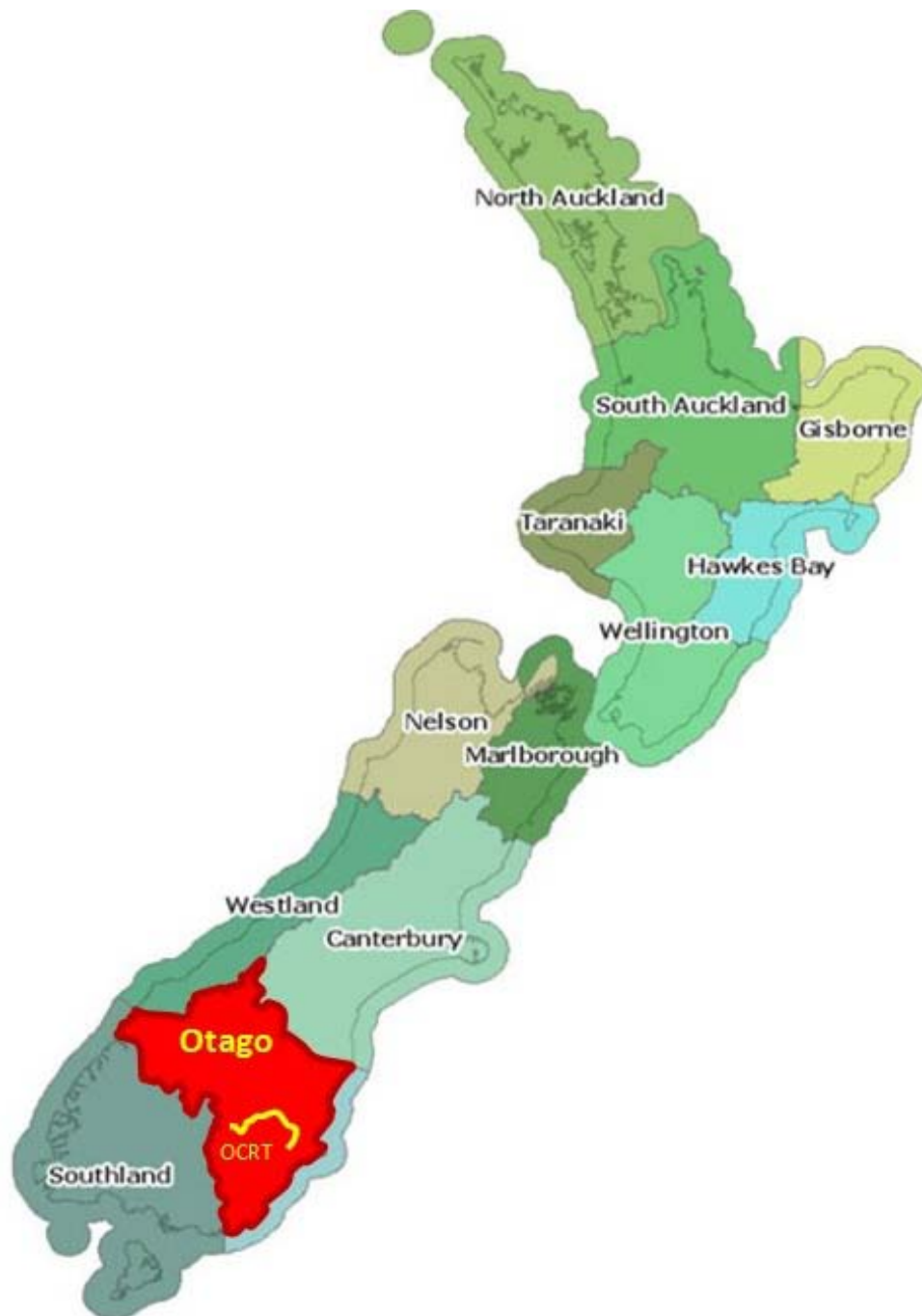


Figure 5.1: OCRT, Otago region, New Zealand

<http://www.linz.govt.nz/sites/default/files/survey-titles/land-registration/land-districts/images/land-districts.jpg>
viewed August 2012

The Department of Conservation (DOC), which had bought the land in 1993, was persuaded to consider the potential for outdoor recreation that the rail land offered. DOC spent six years and more than \$850,000 preparing, upgrading and restoring the closed railway and related historical heritage and infrastructure, which are now viewed as one of the main attractions for OCRT visitors (Burns and Corbet, 2007:62). Jellum and Reis (2008:7) point out that the OCRT was established in February 2000 through a cooperative effort between DOC and the Otago Central Rail Trail Trust, which had been formed in 1994. Since that time, the positive economic and environmental impacts of the OCRT have changed local attitudes and created greater community pride because of its cultural impacts. “Many of those who first opposed the trail now provide services such as farm stays, farm visits, cafes, and accommodation” (Burns and Corbet, 2007:62).

The 150 km recreational rail trail runs west from Middlemarch, travels along the Taieri River valley and through the Maniototo Plains, crosses the Rock and Pillar, North Rough, and Raggedy Ridge ranges, and passes through Ida Valley and Poolburn Gorge along the Manuherikia River (Figures 5.2 and 5.3).

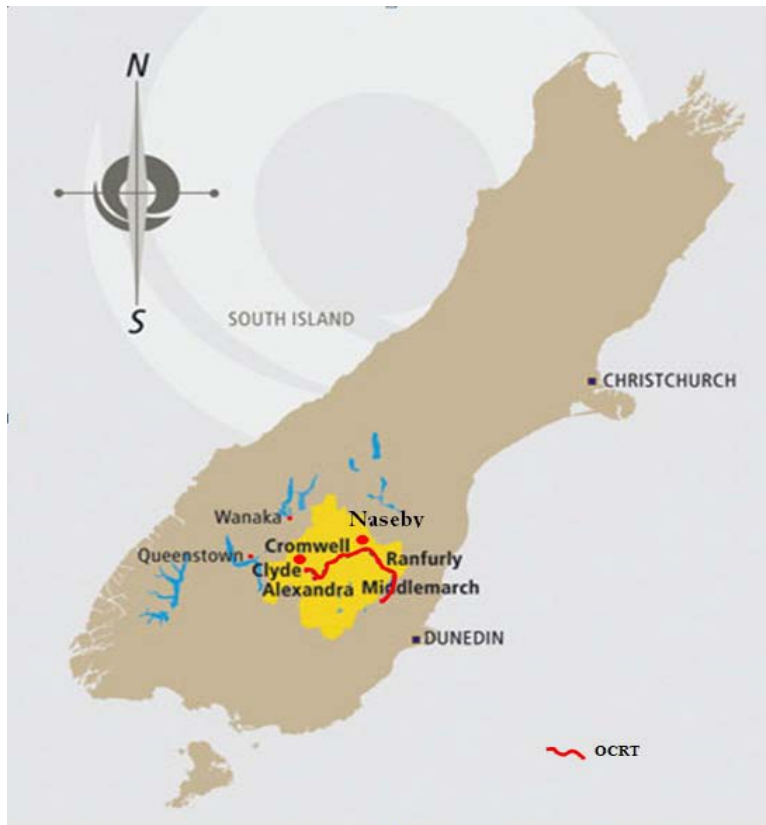


Figure 5.2: OCRT, Otago, South Island, New Zealand
<http://www.centralotagonz.com/rail-trail-map> viewed August 2012

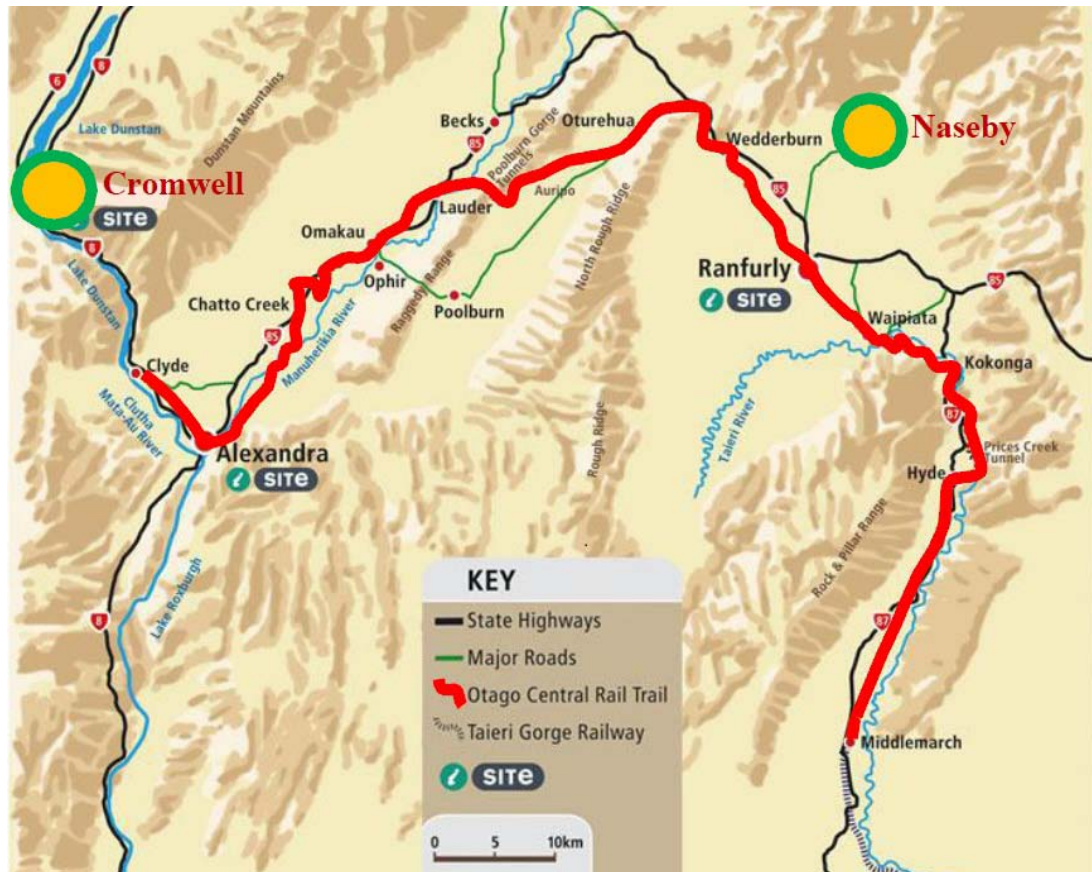


Figure 5.3: OCRT, Naseby and Cromwell, Otago, New Zealand
<http://www.centralotagonz.com/rail-trail-map> viewed August 2012

A trip along the entire 150 km length of the Otago Central Rail Trail may begin at either end, at Clyde (see Figures 5.3 and 5.4) or Middlemarch (see Figures 5.3 and 5.5), and can be cycled in approximately 4 days, walked in approximately 6 days, or experienced by any number of shorter station to station trips.



Figure 5.4: Clyde, Otago, New Zealand
[http://upload.wikimedia.org/wikipedia/commons/thumb/8/84/Panorama_of_Clyde,_Otago,_New Zealand.jpg/640px-Panorama_of_Clyde,_Otago,_New Zealand.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/8/84/Panorama_of_Clyde,_Otago,_New_Zealand.jpg/640px-Panorama_of_Clyde,_Otago,_New_Zealand.jpg) viewed September 2012



Figure 5.5: Middlemarch, Otago, New Zealand

http://www.otagorailtrail.co.nz/index.php?option=com_content&task=view&id=26&Itemid=57#photos1 viewed August 2012

The OCRT's highest point is near the township of Wedderburn, 618 m above sea level, with gentle descents in either direction. Whether visitors are engaged in a multi-day excursion or a one day trip, a large selection of accommodation providers, restaurants, and other businesses support these rail trail visitors both in communities adjacent to the rail trail and at nearby off-trail locations.

5.3. OCRT- Visitors

In this study OCRT visitors are classified into the two groups of international and domestic visitors. In this section information related to each group of OCRT visitors including the number of visitors, OCRT visitor nights, and the home place of visitors by their types is presented.

5.3.1. OCRT Visitor Numbers

As shown in Figure 5.6, in 2009, 10,058 visitors visited the OCTR. This number increased to 12,157 visitors in 2010 (Figure 5.6). In 2011, in comparison with the year 2010, the number of OCRT visitors decreased to 11,788 visitors (Figure 5.6).

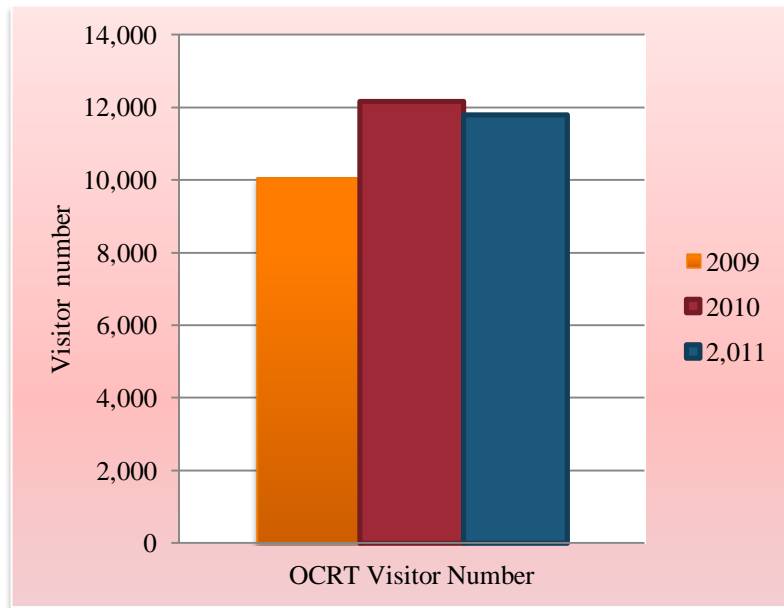


Figure 5.6: OCRT visitor numbers (2009- 2011)

5.3.2. OCRT Average Visitor Nights

Figure 5.7 indicates that in 2009 the OCRT average visitor nights were 3.8. As shown this increased to 4.2 nights in 2010 and dropped to 3.6 in 2011. In comparison with 2009, there were more visitors in 2011 but on average each stayed for less time.

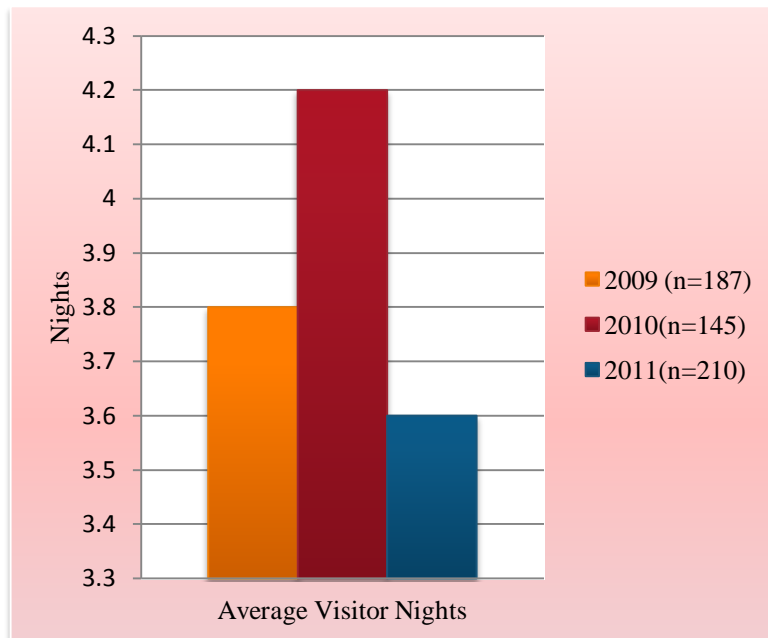


Figure 5.7: OCRT- average visitor nights (2009-2011)

5.3.3. OCRT Visitor Home Place

Three OCRT surveys have been conducted respectively by Central Otago District Council (CODC) (2009); Reis et al (2010); and CODC (2011). These are used in this thesis as the basic data for assessing the home place of OCRT visitors. Figure 5.8 shows that in 2009, 31.2% of the total 602 OCRT visitors sampled came from Auckland and Canterbury (15.6% from each) followed in terms of numbers by 14.3% other North Island, 11.30% Otago, 7% Nelson and Marlborough, 6.5% South Island, 5% local, 4.7% Wellington, 3.5% Australia, 3.2% Europe, 2.3% UK and Ireland and 2.1% North America. Moreover, in 2009, 7.1% of OCRT visitors sampled did not state their home place (Figure 5.8).

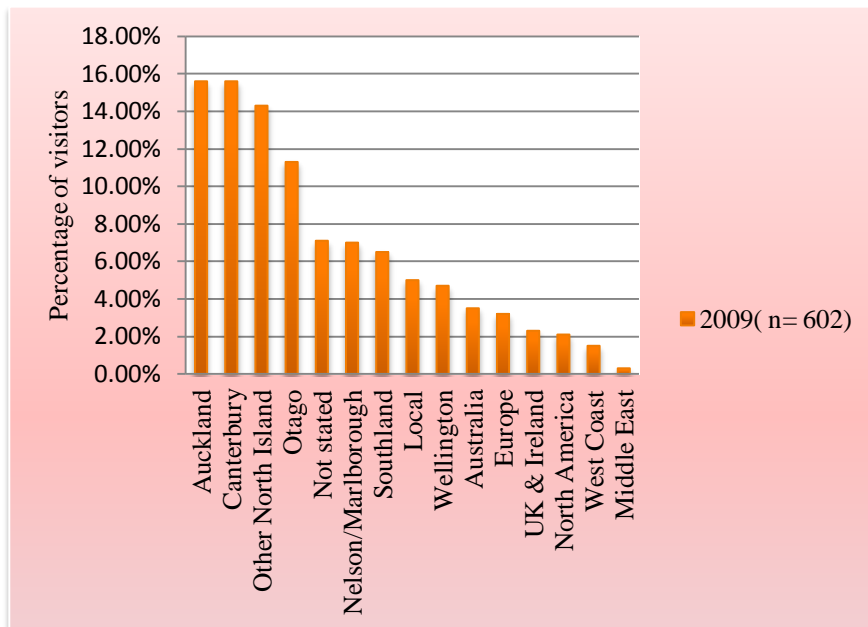


Figure 5.8: OCRT visitor home place – 2009 (CODC, 2009:9)

As shown in Figure 5.9, in 2010, of 154 OCRT visitors sampled 27.9% of them came from the North Island other than its three main cities, followed by 21.4% Auckland, 10.4% South Island other than Christchurch and Dunedin, 14.40% Australia and Wellington (7.20% each), 13% Dunedin and Christchurch (6.5% each), 4.5% Hamilton, 3.2% other international and 5.20% UK and USA (2.60% each).

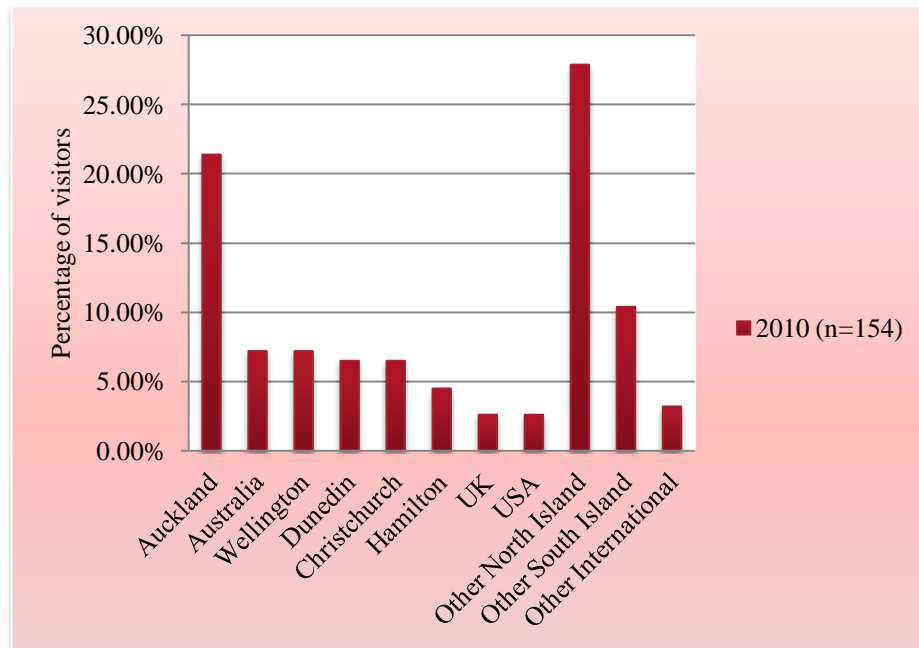


Figure 5.9: OCRT- visitor home place- 2010 (Reis et al, 2010:7)

In 2011, the majority of the 648 OCRT visitors sampled (40%) came from the North Island, closely followed by 38% from the South Island and 22% international (Figure 5.10).

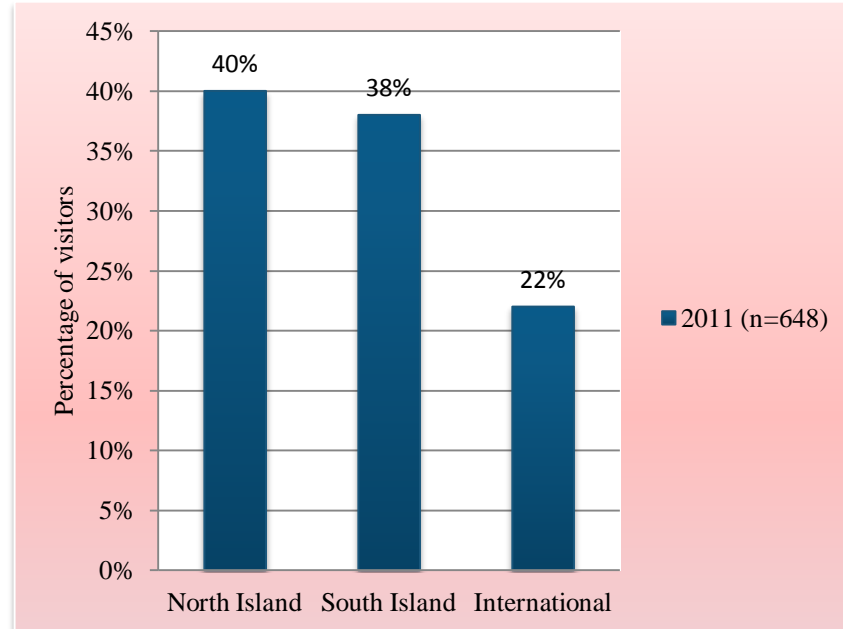


Figure 5.10: OCRT visitor home place- 2011 (CODC, 2011:12)

Since the home place of OCRT visitors is presented in different local, regional, national and international scales by the three surveys (CODS, 2009; Reis et al, 2010; CODC,2011), the results cannot be set out in a figure or table to be compared with each other. As a result, to make a link between OCRT visitor data arising from the three sur-

veys, this study uses the CODC (2011) data as a base format. The OCRT visitor data from CODC (2009) and Reis (2010) are then converted to match the format used in CODC (2011) as shown in Figure 5.11.

Figure 5.11 shows that in 2009, of 602 OCRT visitors sampled, 45.5% came from the South Island followed by 35.9% from the North Island and 11.5% from overseas. In 2009, 7% of OCRT visitors did not state their home place (Figure 5.11). In 2010, the majority or 61% of 154 OCRT visitors sampled came from the North Island followed by 23.4% from the South Island and 15.6% international (Figure 5.11). In 2011, the majority or 40% of 648 OCRT visitors sampled came from the South Island followed by 38% from the North Island and 22% international (Figure 5.11). What this figure shows is that domestic visitors were relatively stable in total, though their home place varied, but international visitor numbers rose.

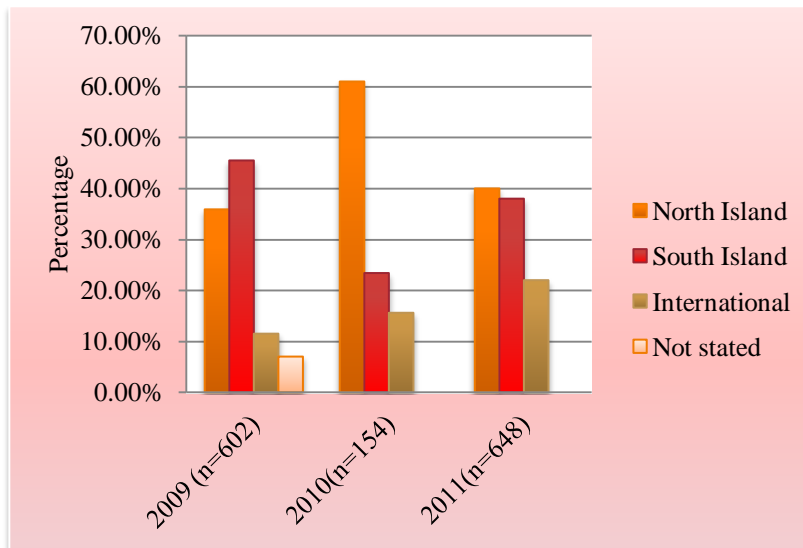


Figure 5.11: OCRT- visitors (2009- 2011)

5.3.3.1. OCRT International Visitors

Table 5.1 shows that in 2009, 11.5% (69 visitors) of all 602 OCRT visitors sampled came from overseas. Of these in 2009, the majority or 3.5% of total sample were from Australia followed by 3.2% Europe, 2.3% UK, 2.2% North America and 0.3% Middle East. As shown in Table 5.1, in 2010, the majority of overseas visitors still came from Australia but had doubled, being 7.1% of the total 154 OCRT visitors sampled, while those from the UK and North America were very slightly up, with 5.2% UK and North America (2.6% each), leaving 3.2% of total as other international. However, this changed in 2011. Table 5.1 indicates that of 648 OCRT visitors sampled in 2011, the

majority or 42.7% were now from Europe (except UK) followed by 32.9% Australia, 12.6% UK, 9% North America and 1.4% each from the Middle East and South Africa.

Table 5.1. OCRT- International visitors (2009-2011)

Home place	2009 (n=602)		2010 (n=154)		2011 (n=648)	
	NV ³	%	NV ³	%	NV ³	%
Europe	19	3.2	-	-	61	42.7
Australia	21	3.5	11	7.1	47	32.9
UK	14	2.3 ¹	4	2.6	18	12.6
North America	13	2.2	4 ²	2.6	13	9
Middle East	2	0.3	-	-	2	1.4
South Africa	-	-	-	-	2	1.4
Other International	-	-	5	3.2	-	-
Total	69	11.5	24	15.5	143	22

1. In 2009, UK includes UK and Ireland.
2. In 2010, USA used as the home place of visitors from America.
3. NV: Number of international visitors.

As shown in Figure 5.6 the total number of OCRT visitors in 2011 was 11,788. This study uses the percentages of OCRT visitor home place (cited in Table 5.1) that are based on OCDC (2011:12) (n=648) to calculate the total numbers of OCRT international visitors by their home place (Table 5.2).

In 2011, of 11,788 OCRT visitors coming from overseas the majority or 1,107 (42.7%) were from Europe followed by 853 (32.9%) Australia, 327 (12.6%) UK, 234 (9%) North America, and 72 (2.8%) Middle East and South Africa (1.4% each) (Table 5.2). In total this was 22% of all visitors.

Table 5.2: OCRT- International visitors (2011)

Home place	NV ³	%
Europe	1,107	42.7
Australia	853	32.9
UK	327	12.6
North America	234	9
Middle East	36	1.4
South Africa	36	1.4
Other International	-	-
Total	2,593	22

1. NV: Number of Visitors.
2. Total visitor numbers (2011) = 11,788
3. Percentage of International visitors (2011) = 22%

5.3.3.2. OCRT Domestic Visitors

Figure 5.12 shows that in 2009, 30% of the 602 OCRT domestic visitors sampled were from the upper North Island (NI) followed by 27.5% upper South Island (SI), 18.40% Central SI (Otago), 9% Lower NI, 7.30% Lower SI, and 7% did not state their home place.

In 2010, although the majority (56.54%) of 154 OCRT visitors sampled came from Upper NI, other relative positions had changed with 15.76% from Lower NI, 12.30% Central SI (Otago) and 15.4% Upper SI and Lower SI (each 7.7%) (Figure 5.12). In 2011, the majority (35.8 %) of 648 OCR visitors sampled were still from the Upper NI followed by 22.75% central SI, 21.20% Upper SI, 14.90% Lower NI and 5.35% Lower SI (Figure 5.12).

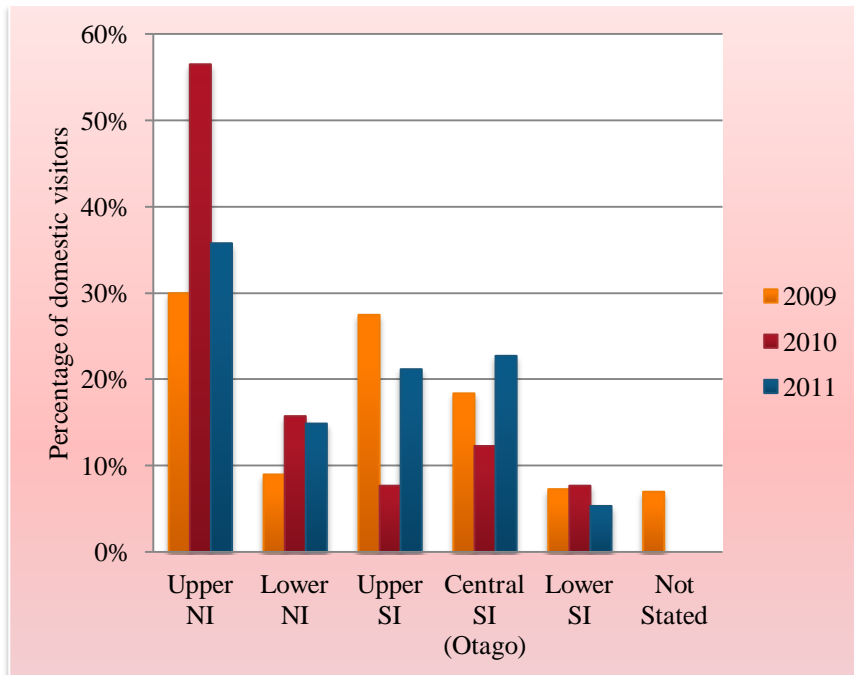


Figure 5.12: OCRT- domestic visitors (2009-2011)

This study calculates the numbers of OCRT domestic visitors in 2011 by their home place (Table 5.3), based on the percentages of OCRT domestic visitors from the OCDC survey (2011) shown in Figure 5.12. According to CODC (2011) 78% of the total 648 OCRT visitors sampled are domestic visitors (Figure 5.8). Using this portion as a base, 9,195 (78%) of 11,788 (total number of OCRT visitors in 2011, shown in Figure 5.6) can be considered domestic visitors (Table 5.3).

From the discussion above, in 2011 most domestic visitors came from Upper NI, the estimated number being 3,292 (35.8%) of 9,195 (100%). This is followed by 2,092 (22.75%) from central SI (Otago), 1,949 (21.2%) Upper SI, 1,370 (14.9%) Lower NI and 492 (5.35%) Lower SI (Table 5.3). In 2011, as Figure 5.13 illustrates, of 11,788 (100%) OCRT visitors, 9,195 (78%) were domestic and 2,593 (22%) were international.

Region/ city	Number of visitors	%
Upper NI	3,292	35.8
Lower NI	1,370	14.9
Upper SI	1,949	21.2
Central SI (Otago)	2,092	22.75
Lower SI	492	5.35
Total	9,195	100

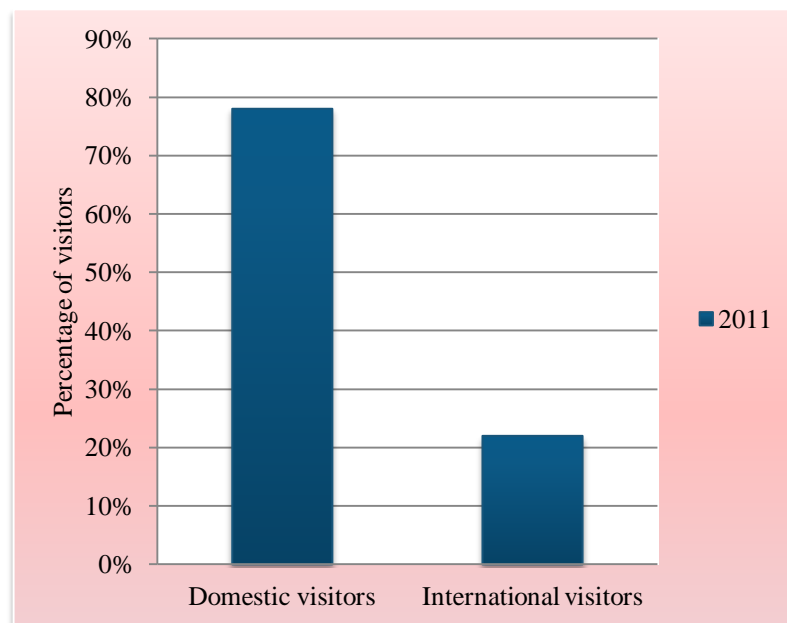


Figure 5.13: OCRT- domestic and international visitors (2011)

5.4. OCRT Transportation

This section explores types of international and domestic transportation used by OCRT visitors and calculates their Ecological Footprints (EFs). The total EF of OCRT transportation is calculated through integration of the EFs of international and domestic transportation.

5.4.1. OCRT- Types of International Transportation

Since travelling from overseas to New Zealand by car, bus and train is not possible because of its geographical location, and because of the long travel times involved using ships, in this study of international transportation only airlines are considered.

5.4.1.1. OCRT International Tourist-kilometres (T-Km)

Table 5.4: shows that 2,593 OCRT visitors (22%) are international tourists and the total distance between their home places and Auckland’s international airport is equivalent to 32,041,486 Tourist-km (T-km). International distances are calculated here as a one way trip because their ecological footprint is assumed to be related to where the plane is re-fueled and so is divided between New Zealand and the home country. It could equally be argued that the full international trip should be counted, as belonging to the individual tourist’s holiday that included the OCRT, but this has not been done in this thesis. Due to international tourists having to travel from Auckland to Dunedin and back this part of the journey is a domestic return flight and is equivalent to 5,590,508T-km, which is shown in Table s.5.4 and 5.7 as ‘Air domestic international visitors’.

Home place	Assumed city of origin (central in country of origin)	Distance between central cities and Auckland (km).	Visitors		Total International T-km	Auckland to Dunedin (km, return)	Air domestic International visitors T-km from Auckland to Dunedin (return)
			No	%			
Australia	Sydney and Melbourne	2,512	853	32.9	2,142,736	2,156	1,839,068
Europe	Frankfurt	18,180	1,107	42.7	20,125,260	2,156	2,386,692
UK	London	18,334	327	12.6	5,995,218	2,156	705,012
North America	Montana Billings	11,950	234	9	2,796,300	2,156	504,504
Middle East	Tehran	15,005	36	1.4	540,180	2,156	77,616
South Africa	Pretoria	12,272	36	1.4	441,792	2,156	77,616
Total	-	-	2593	100	32,041,486	-	5,590,508

As demonstrated in Table 5.4, to calculate the international T-km, the distance between the capital city of the home country of each visitor (except Australia) and Auckland was calculated and used as the international T-km. Since in Australia, just over half the population live in Sydney and Melbourne (Australian Government, 2010), the average distances between these cities and Auckland has been calculated and used as the interna-

tional visitor distance from Australia. The flight distances between the international visitors home countries and Auckland have been calculated using a Flight Distance Calculator (<http://www.travelmath.com/flying-distance>).

In Table 5.4, total international T-km for each visitor home country is calculated through the following equation:

Distance between central city of the home country and Auckland (km) × visitor numbers from the home country = T-km

In Table 5.4, total international T-km is the sum of all identified international visitor T-km. Likewise in Table 5.4 air domestic international visitor T-km from Auckland to Dunedin (return) is calculated as the number of international visitors × distance between Auckland and Dunedin (2,156 km return).

5.4.2. OCRT Types of Domestic Transportation

The types and percentages of transport used for holidays in New Zealand as shown in Table 5.5 (Matthews, 2009:13) are used as a pattern for transport used to access the OCRT. Data from Matthews (2009) is used as the basis of the transport calculations as it is the most recently available study on New Zealand domestic tourist transportation. Table 5.5 indicates that in 2009, the majority or 87 % of New Zealanders, used car/van (driver and passenger) for recreational travelling followed by 5% pedestrian, 5% bus/train/ferry, and 2% bike. In Table 5.5, air domestic travel is included in ‘motorcyclists and other’ that are less than 1 percent of the total types of transportation used.

Since Matthews (2009) does not include data on domestic tourist air travel, this category is not included in Table 5.5. Due to the lack of data related to domestic international tourist travel and the domestic tourist air travel the following two assumptions are made in this thesis:

First: All International OCRT visitors use domestic air travel (Auckland to Dunedin return) to access the OCRT (Table 5.4).

Second: All domestic OCRT visitors use land travel to access the OCRT (Table 5.5).

Table 5.5: Types of transportation used by New Zealanders for recreational travelling

Activity	Car/van driver	Car/van passenger	Pedestrian	Cyclist	Bus/train/ferry	Total (incl motorcyclists and other)
Recreational	42%	45%	5%	2%	5%	100%

• Reference: (Matthews, 2009:13)

5.4.2.1. OCRT Domestic Tourist-Kilometres (T-km)

This thesis uses Auckland as being the central city for the Upper NI, with Wellington (Lower NI), Nelson /Marlborough (Upper SI), Otago (central SI) and Invercargill (Lower SI) to calculate the distance between domestic visitor home places and the OCRT (Table 5.6). Moreover, to measure the distance between the OCRT and the home places of visitors from the Upper SI, the distances between Nelson–OCRT and Marlborough–OCRT are calculated and averaged (Table 5.6). Since the OCRT is in Otago these distances to Middlemarch (the OCRT starting place) are considered separately.

Table 5.6: OCRT- car based domestic T-km

Region	Central city	Distance to Middlemarch (km-return)				Number of Visitors	Domestic road T-km	Domestic ferry T-km
		Auckland to Wellington	Wellington to Picton	Picton to Middlemarch	Total			
Upper NI	Auckland	1,318	204	1,480	3,002	3,295	9,219,410	672,180
		-	204	1,480	1,684			
Lower NI	Wellington	-	204	1,480	1,684	1,370	2,027,600	279,480
Upper SI	Nelson/ Marlborough	1,686			1,686	1,949	3,286,014	
Central SI	Otago	125			125	2,092	261,500	
Lower SI	Invercargill, Southland	488			488	492	240,096	
Total	-	-			-	9,195	15,034,620	951,660

- Distance between Upper SI and Middlemarch is calculated as the average of distances between Nelson and Middlemarch and Marlborough and Middlemarch.
- Average distance between Central Otago cities and OCRT.

OCRT visitors who come by car/van from Upper NI (Auckland) and Lower NI (Wellington) (grey areas in Table 5.6) need to use the ferry to cross to the South Island. Distances between these places and Middlemarch are separated into three parts; home to Wellington (except Wellington); Wellington to Picton by ferry; and Picton to Middlemarch (Table 5.6). Car visitors are here assumed to be 87% of total (8,000 out of 9,195 domestic visitors). The first scenario assumes that all OCRT visitors (9,195 total) come by car (Table 5.6). However, according to Matthews only 87% of recreational travel is

by car and in New Zealand 1% of people going on holiday are pedestrians (Matthews, 2009:13). In this study pedestrians have been ignored as the OCRT is far from the places of origin of visitors. Using Matthews' break down of recreational travel in Table 5.5 as a basis, the second scenario assumes the remaining 13% of visitors are split so that 10% reach the OCRT trail by bus and the remaining 3% use domestic air travel (Table 5.7. a). All bus travel is assumed to be in the SI and the distances are calculated based on the split shown for car travel in Table 5.6. Similarly, air travel is split proportionally Auckland to Dunedin and Wellington to Dunedin.

Type of transport	Car/van/driver/passenger road travel	Car/van/driver/passenger ferry travel	Bus	Air domestic
% of total	87		10	3
Tourist-km	13,080,119	827,944	768,133	400,178
Number of visitors	8000		919 (395 Upper SI; 423 Otago; 101 Invercargill)	276 (177 from Auckland, 2120km; 99 from Wellington, 1262 km)

These two scenarios will be used to work out the EF of domestic travel, to see the effect of the assumptions made.

5.4.3. The Ecological Footprint (EF) of OCRT-Transportation

Table 5.8 shows that international and domestic transportation energy use of OCRT international visitors (2011) is equivalent to 61,743,029 MJ or 61,743 GJ. The land to energy conversion capacity of New Zealand is assumed to be equivalent to 100 GJ/gha (Field, 2011:11). As demonstrated in Table 5.8 the EF of OCRT transportation for international visitors is equivalent to 61,743 GJ/ 100 GJ/gha= 617 gha.

5.4.3.1. Scenario 1 for Domestic Visitors

Using the same method, the EF of domestic visitors assuming that all travel is by car is 552 gha (Table 5.7.b)

Transport mode	Tourist-km	MJ/passenger-km	Total energy use per yr by OCRT visitors (MJ)
Car/van driver and passenger	15,034,620	3.1 (average)	46,607,322
Car-ferry	951,660	9.06	8,622,040
Total			55,229,362
EF for domestic travel			552gha

5.4.3.2. Scenario 2 for Domestic Visitors

The EF of domestic visitors assuming that 87% come by car and the others use bus and air travel, is 504 gha (Table 5.7.c)

Transport mode	Tourist-km	MJ/passenger-km	Total energy use per yr by OCRT visitors (MJ)
Car/van driver and passenger	13,080,119	3.1 (average)	40,548,369
Car-ferry	827,944	9.06	7,501,173
Bus	768,133	1.01	775,814
Air travel	400,178	3.88	1,552,691
Total			50,378,047
EF for domestic travel			504gha

Taking the larger result from the two domestic transport scenarios and adding it to the international air travel gives the following result, as shown in Table 5.8. The total transportation EF for international and domestic visitors is 1,169gha.

5.4.3.3. OCRT- Transport EF

Transport mode	Tourist-km	Energy use MJ/passenger-km	Total energy use per yr by OCRT visitors (MJ)
Air international	32,041,486	1.25 (Boeing 747)	40,051,858
Air domestic (International visitors from Auckland to Dunedin)	5,590,508	3.88	21,691,171
Sub total			61,743,029
EF international travel			617gha
EF domestic travel			552gha
Total transport EF			1169gha

What this demonstrates is 22% of OCRT visitors because they are international account for 53% of the transportation EF, a not unexpected result.

5.5. OCRT: Food

The food EF of OCRT visitors is equal to the area which is needed to produce the food consumed by tourists during their use of the OCRT. The four factors involved in this assessment are: the number of OCRT visitors, average number of nights they stay during their visit, food eaten out per visitor, and the EF of the consumed food per visitor.

As shown in Figure 5.6, 11,788 visitors used the OCRT in 2011 and as Figure 5.7 shows, each tourist stayed an average of 3.6 nights. Thus, for this calculation the total visitor nights for tourists coming to the OCRT are 42,437 visitor nights. Because of the lack of local information, the food consumption data presented by Collins et al (2005) are used to calculate the EF of food consumption for OCRT visitors.

This thesis uses two scenarios to calculate the EF of food consumed by OCRT visitors in 2011. In the first method, the EF is calculated based on the assumption 100% of food consumed is conventional food eaten out. In the second method, the total amount of food eaten by OCRT visitors is separated into the two areas of local (home prepared) food and conventional food. Comparison between the results of the two methods will indicate the influence exerted by the use of home cooked food (as a cultural product) on the EF and the Economic Footprint (ECF) of the OCRT.

5.5.1. The EF of OCRT Consumed Food—First Scenario

In the first scenario, the total amount of food eaten by OCRT visitors has been assumed to have a footprint equivalent to that of food consumed outside the home by Cardiff residents. This totals 67.04 kg per resident/yr (Collinset al, 2005:25) with a footprint of 0.429 gha/ resident (Collins et al, 2005:32). This means 1kg of food eaten out has an EF of $0.429/67.04 \text{ gha/kg}=0.006 \text{ gha/kg}$. The average amount of food eaten by a Cardiff resident each day is 1.85 kg, and this value has been used for visitors to OCRT. The results are shown in Table 5.9. The EF of tourist food is equivalent to $1.85 \times 0.006 = 0.01 \text{ gha/visitor night}$ (Table 5.9). The total ecological footprint of food consumed by OCRT visitors is equivalent to $42,437 \times 0.01 = 424.4 \text{ gha}$ and the EF of food consumed by ORCT visitors/visitor is equivalent to $424.4/11,788 = 0.036 \text{ gha}$ (Table 5.9)

Table 5.9: EF of food consumed by OCRT visitors (2011)

Item	Data	Reference
OCRT visitor numbers (2011)	11,788	
Average visitor nights/ visitor	3.6	
Total visitor nights	42,437	
EF of food eaten out gha/cap	0.429	Collins et al, 2005:32
EF of tourist food gha/visitor night	0.01	
Total EF of food consumed by OCRT visitors (gha)	424.4 (gha)	
EF of food consumed by OCRT visitors/visitor(gha)	0.036 (gha/visitor)	

5.5.2. The EF of OCRT Consumed Food—Second Scenario

This thesis explores the local products (such as food, beverages, and wine) offered to OCRT visitors by the 783 separate accommodation services available with their 5,543 bed spaces. These accommodation services are located along the OCRT from Middlemarch to Clyde (Appendix5). This information has been collected through the use of the official website of the OCRT and by referring to the 201 websites belonging to each accommodation service, which are accessed through the OCRT website (Appendix5). The information related to OCRT products and activities arising from Appendix5 is summarised and set out in Appendix7. This appendix is used as the base to develop the related figures and Tables about OCRT locally produced food used in the following part of this section.

Figure 5.14 and Table 5.10 demonstrate that in 2011, 234 separate OCRT accommodation services offered local produce in four identifiable categories. Of these, 56.40% offered home baking and local food and beverages to their visitors, followed by 39.3% offering locally produced alcoholic drinks, 3.4% local grazing (for horses) and 0.9% local art works and crafts.

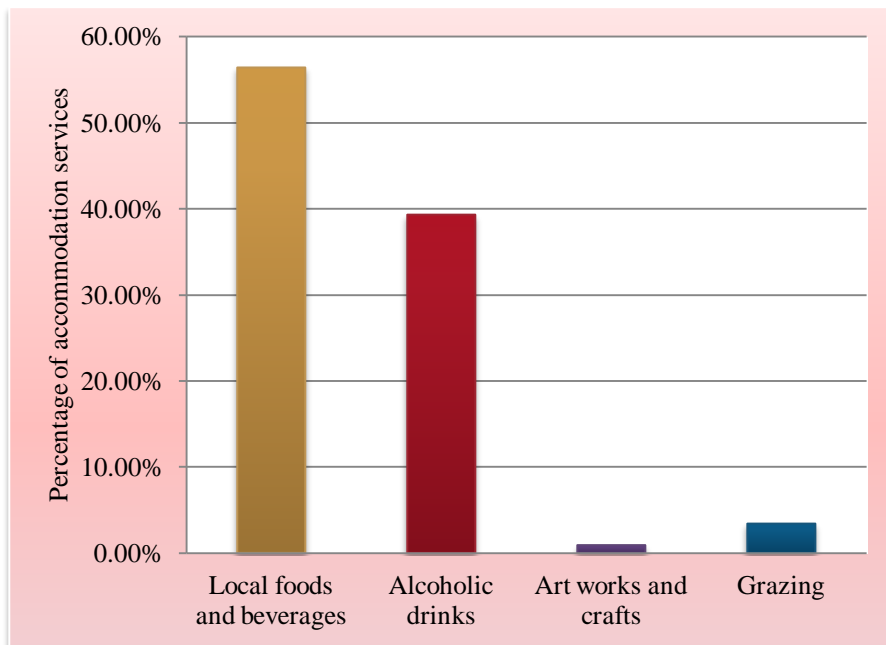


Figure 5.14: OCRT- Frequency of local produce offered by accommodation services to visitors (2011).

Table 5.10 shows that 132 OCRT accommodation services (16.9 % of the total 783 OCRT accommodation services) make available local and home baked foods. As a result an equivalent 937 (16.9% of 5,543) bed spaces serve local food to their users. As

discussed above, in 2011 total visitor nights were equivalent to 11,788 (OCRT visitors \times 3.6 (average visitor nights/visitor – see Figure 5.7) = 42,437. As the number of total available bed spaces of the OCRT is 5,543 bed spaces, consequently, the average number of visitor nights per bed space is 42,437 (total visitor nights) / 5,543 (total bed spaces) = 7.7 (visitor nights / bed space).

It should be remembered that 3.6 (average visitor nights/visitor) is a number that involves two factors, the number of OCRT visitors and the number of nights that they stay in OCRT. But 7.7 (visitor nights/bed space) is a number that indicates the time that each of the bed spaces is used based on total visitor nights. If the total numbers of bed spaces were equal with the total number of visitors, both average visitor nights/visitor and average visitor nights/ bed space would be equal, but that does not happen in OCRT. As a result, the total visitor nights that visitors use local foods are 937 (bed spaces available in establishments which offer local food) \times 7.7 (nights per bed space) = 7,215.

Table 5.10: OCRT- local produce (summary)

Produce	F	% of 783 accommodations services	Bed spaces	Visitor nights ¹
Local food and beverage	132	16.9	937	7,215
Alcoholic drinks	92	11.7	649	4,997
Art works and crafts	2	0.3	17	131
Grazing (for those doing OCRT on horseback)	8	1	55	424
Total	234	29.9	1,658	12,767

1. Average visitor nights/ bed space = 42,437 (total visitor nights) / 5,543 (total bed spaces) = 7.7

As shown in Appendix 5, all OCRT accommodation services that produce local and home cooked foods use productive gardens and local farm produce as their main sources when preparing such food. Assuming that OCRT local foods are the equivalent of organic food, it is possible to compare the EF of local and conventional food consumed by OCRT visitors.

The difference between The EFs of conventional and organic foods arises from the energy used to produce and process these types of food. Collins and Fairchild (2009:11) argue that the ecological footprint for food and drink consists of two main components: ‘real land’ requirements (i.e. crop, pasture, sea) and ‘energy land’. “The former relates to the area of land required to rear and grow food produce, the latter relates to the embodied energy required for food production and its processing.” (Collins and Fairchild, 2009:11). Due to a lack of information, Collins and Fairchild (2009) assume the real

land for conventional and organic foods is equal. They (2009:15) argue that since the production of conventional food is more energy intensive than the production of organic food it consequently has a bigger EF than organic food.

Table 5.11 indicates that in comparison with conventional food, organic food has a 40 % (0.52gha) lower EF.

Table 5.11: The effect on footprint of consuming food from 100% organic sources.

	100% conventional	100% organic
Ecological footprint of food (gha/person)	1.315	0.799
Ecological footprint of transporting food (gha/person)	0.022	0.022
Total ecological footprint	1.337	0.817

• Reference: Collins et al, 2005: 36

Consequently, this study uses 60% of the EF of conventional food (0.429gha/cap) as the EF of local and home baked food (0.254gha/cap) to calculate the whole EF of OCRT food in 2011 (Table 5.12). The EF of 1 kg home cooked food is equivalent to 0.254/67.04 (eaten out food/resident/year in Cardiff) = 0.0037 gha/kg (Table 5.12). Table 5.10 shows that 132 OCRT accommodation services with the capacity of 937 bed spaces offered local food to their visitors. The total visitor nights those OCRT visitors consumed local food is 7,215 (Table 5.10). The EF of OCRT local food is equivalent to 0.0068 gha/ visitor night (0.0037 gha/ kg × 1.85 kg) and the total EF of OCRT local food per year is equivalent to (7,215 visitor nights × 0.0068 gha/ visitor night) or 49 gha (Table 5.12). The number of visitor nights when OCRT visitors consumed conventional food is 35,222 visitor nights (42,437 total OCRT visitor nights – 7,215 visitor nights when local food is consumed). The EF of OCRT conventional food is 352.2 gha (Table 5.12). The total EF of OCRT local and conventional food as shown in Table 5.12 is 401.2 gha.

Table 5.12: Ecological footprint of home cooked and conventional foods consumed by OCRT visitors (2011)

Home cooked and local food	EF	Conventional food	EF
EF of local food gha/cap	0.254	EF of 1 kg conventional food eaten out (gha/cap)	0.429
EF of 1 kg local food gha/kg	0.0037	EF of tourist food (gha/visitor night)	0.01
EF of local food gha/ visitor night	0.0068		
EF of local food of 7,215 visitor nights (gha)	49	Total EF of consumed conventional food by OCRT visitors/ 35,222 visitor nights (gha)	352.2
Total EF of home cooked and conventional foods			401.2

5.5.3. Environmental Effects of Using Local Food

Comparing the results of the two scenarios shows that producing 17% of OCRT food locally reduces the total EF of food by 23.2 gha (5.5% of 424.4 gha) (Table 5.13).

	100% conventional eaten out food	83% conventional eaten out food and 17% home cooked (organic) food
OCRT EF of food	424.4 ¹	401.2 ²
Reduction in EF of food consumed by OCRT visitors (gha)	23.2 ³	
1. 424.4 gha/ 11,788 OCRT visitors = 0.036 gha/visitor 2. 401.2 gha/ 11,788 OCRT visitors = 0.034 gha/visitor 3. 23.2 gha / 11,788 OCRT visitors = 0.002 gha/visitor		

5. 6. OCRT Built up land: Accommodation Services

5.6.1. OCRT: Types of Accommodation Service

This research categorises the total number of 783 OCRT accommodation services into seven categories; self-contained (SC), bed and breakfast (B&B), backpacker (Bp), motel, homestead, hotel and camping. Again categories have been derived through using the official web site of OCRT and 210 related accommodation services websites (Appendix 5 and 6). Table 5.14 summarises the parts of Appendix 5 that address available bed spaces by types of accommodation service.

As shown in Table 5.14, in 2011, of the total 783 separate accommodation services the majority or 71.1% are camping sites followed by 11.8% SC and 8.5% B&B. There are small numbers of other types of OCRT accommodation services including Bp, motel, homestead, and hotel in the range of 1.5- 4.2% of total (Table 5.14). As shown in Table 5.14 the majority of available bed spaces are in camping sites (59.8%) followed by 12% motel, 9.8% B&B and 9.2% SC. Other types of OCRT accommodation services including, Bp, homestead and hotel hold between 0.5 – 6.2% of available bed spaces (Table 5.14 and Figure 5.15).

Type	Number of type	%	Available bed spaces	%
SC ^{1,4}	92	11.8	510	9.2
B&B ²	66	8.5	541	9.8
Bp ³	12	1.5	136	2.5
Motel ⁵	33	4.2	665	12
Homestead	4	0.5	28	0.5
Hotel ⁶	19	2.4	346	6.2
Camping	557	71.1	3,317	59.8
Total	783	100	5,543	100

1. SC: Self contained
 2. B&B: Bed and breakfast
 3. Bp: Backpacker
 4. Capacity of 1 unknown SC accommodation service is calculated as average bed spaces of all SC = 6
 5. Capacity of 1 unknown motel is calculated as average bed spaces of all motels = 20
 6. Capacity of 1 unknown hotel is calculated as average bed spaces of all hotels = 18

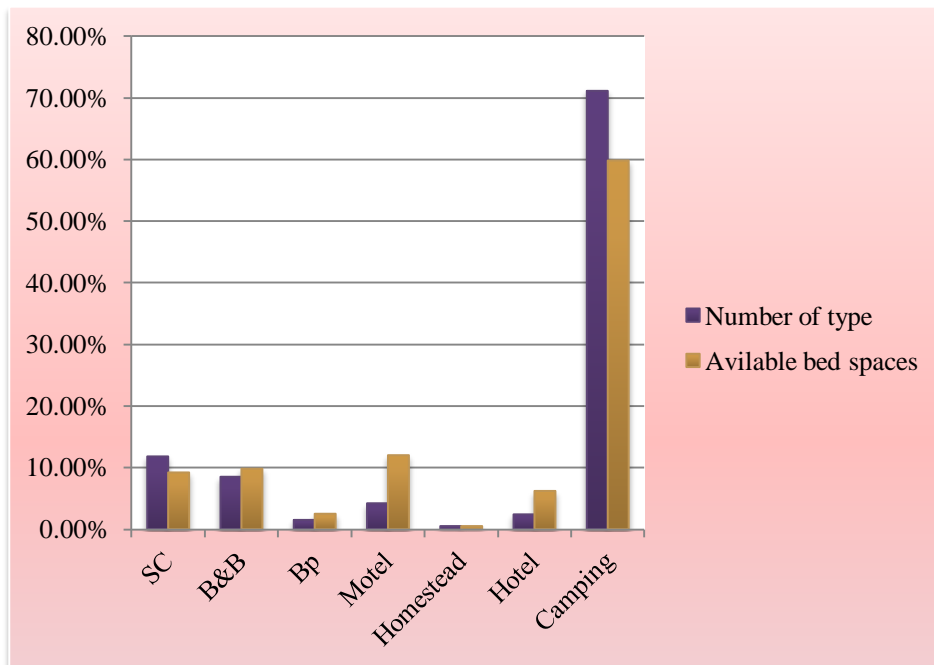


Figure 5.15: OCRT- Percentage of type and available bed spaces by types of accommodation services.

5.6.2. Quality of OCRT Accommodation Services

According to the information shown in Appendix 5 and summarised in Table 5.15 this study qualitatively classifies OCRT accommodation services into the two types of new (NB) and refurbished (RB) buildings.

Type	TNA	% ¹	RB	% ¹	NB	% ¹	Capacity			
							RB		NB	
							C	% ²	C	% ²
SC	92	11.8	30	3.8	b	7.9	159	2.9	351	6.3
B&B	66	8.5	22	2.8	44	5.6	159	2.9	382	6.9
Bp	12	1.5	4	0.5	8	1	53	1	83	1.5
Motel	33	4.2	1	0.1	32	4.1	22	0.4	643	11.6
Homestead	4	0.5	3	0.4	1	0.1	22	0.4	6	0.1
Hotel	19	2.4	18	2.3	1	0.1	298	5.4	48	0.9
Camping	557	71.1	-	-	557	71.1	-	-	3317	59.8
Total	783	100	78	10	705	90	713	12.9	4830	87.1

1. The percentages of the number of renewed/historic and new constructed buildings are calculated based on total number of accommodation services (n=783).

2. The percentages of the capacities of renewed/historic and new constructed buildings are calculated based on total capacity of OCRT accommodation services (5543 bed spaces).

- TNA= Total Number of Accommodation Services of the Type.
- RB= Refurbished Buildings used as accommodation services.
- NB= New Buildings used as accommodation services.
- C=Capacity

In OCRT, RB accommodation services cover a range of historical and restored buildings with different original functions, but currently all of them are used for visitor accommodation. Table 5.15 shows the number and percentage of NB and RB buildings used as accommodation services in the OCRT. Moreover, this table demonstrates the number and percentage of available bed spaces of NB and RB OCRT accommodation services by type. As shown in Table 5.15 and Figure 5.16, of 781 OCRT accommodation services, only 10% are RB and 90% are NB.

Table 5.15 and Figure 5.17 show that of all OCRT available bed spaces 12.9% are RB and 87.1% are NB.

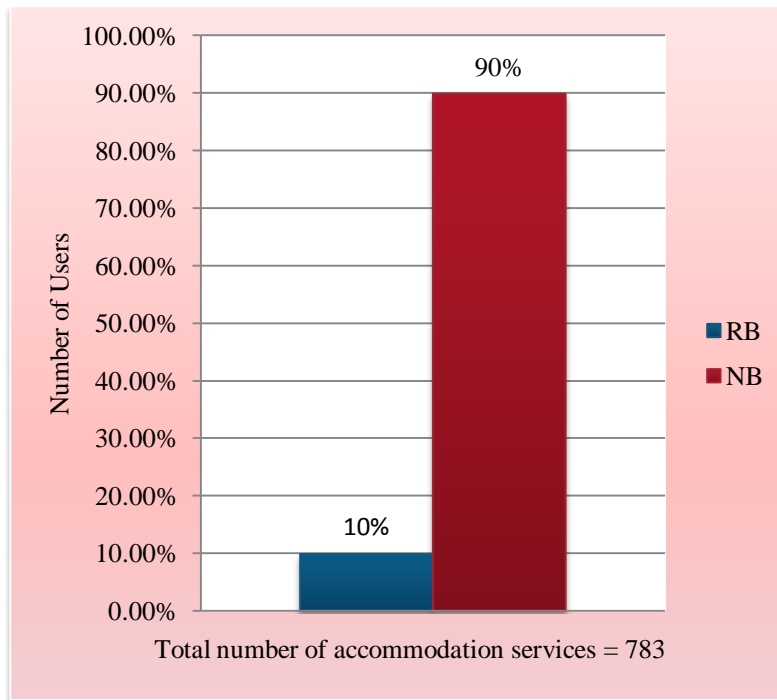


Figure 5.16: OCRT- RB and NB buildings used as accommodation services

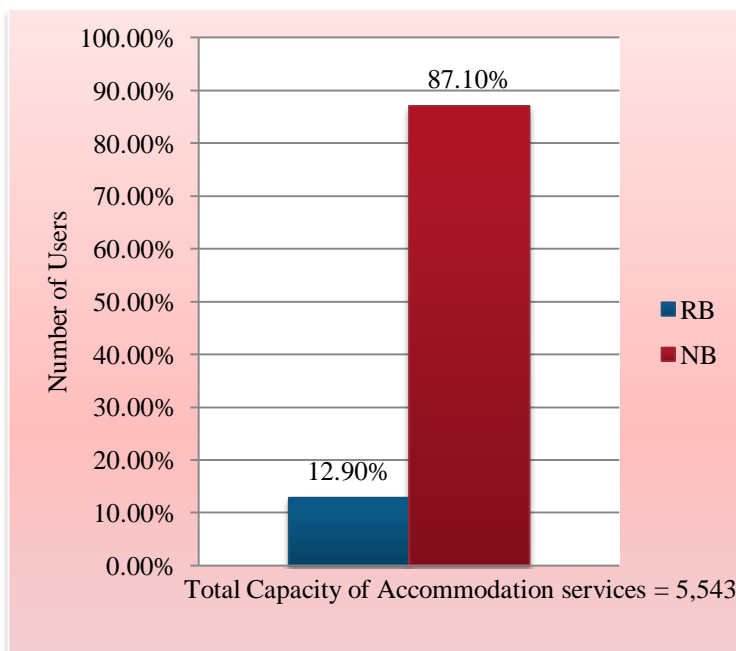


Figure 5.17: OCRT- RB and NB accommodation services – available bed spaces (2011)

Figure 5.18 and Table 5.15 indicate that of the 10% (78) RB accommodation services, the majority or 3.8% of total (30) are SC, followed by 2.8% (22) B&B, and 2.3% (18) hotel. Other RB types of accommodation including Bp, motel, homestead and camping only make up 0-0.5% of total. Moreover as shown in Figure 5.18 and Table 5.15, of 90% of total (705) NB accommodation services, the majority or 71.1% (557) are camp-

ing sites (powered and non-powered) followed by 7.9% (62) SC, 5.6% (44) B&B and 4.1% (32) motel. Other NB types of accommodation services including B&B, Bp and hotel only make up 0.1-1 % of total (Figure 5.18 and Table 5.15).

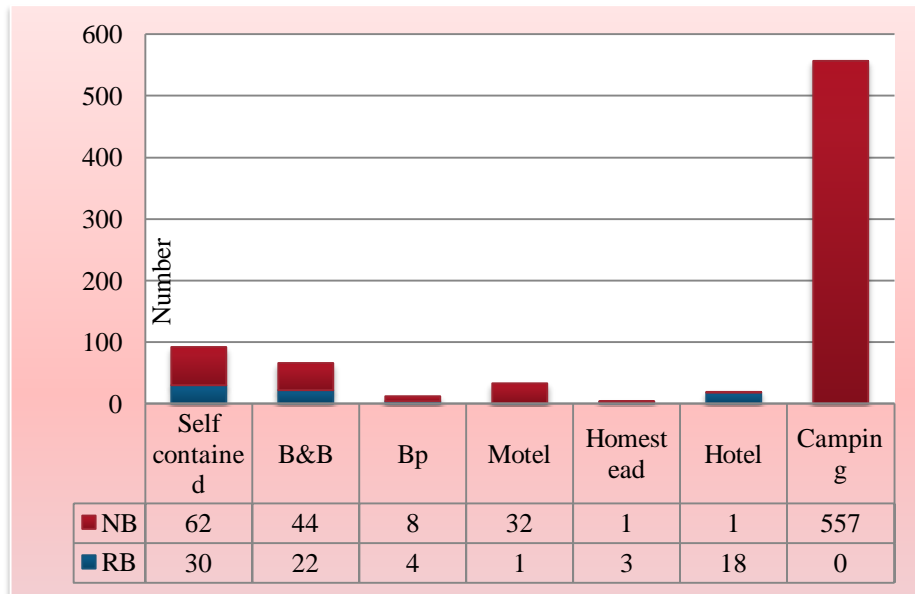


Figure 5 18: OCRT- number of RB and NB accommodation services

Table 5.15 and Figure 5.19 indicate that of the 12.9% (713 out of 5,543) RB available bed spaces, the majority 5.4% are found in the hotel category, while 5.8% of total are equally divided between SC and B&B (2.9% each type). Other RB bed spaces including Bp, homestead, motel and camping sites only make up 0-1% of total (Table 5.15 and Figure 5.19).

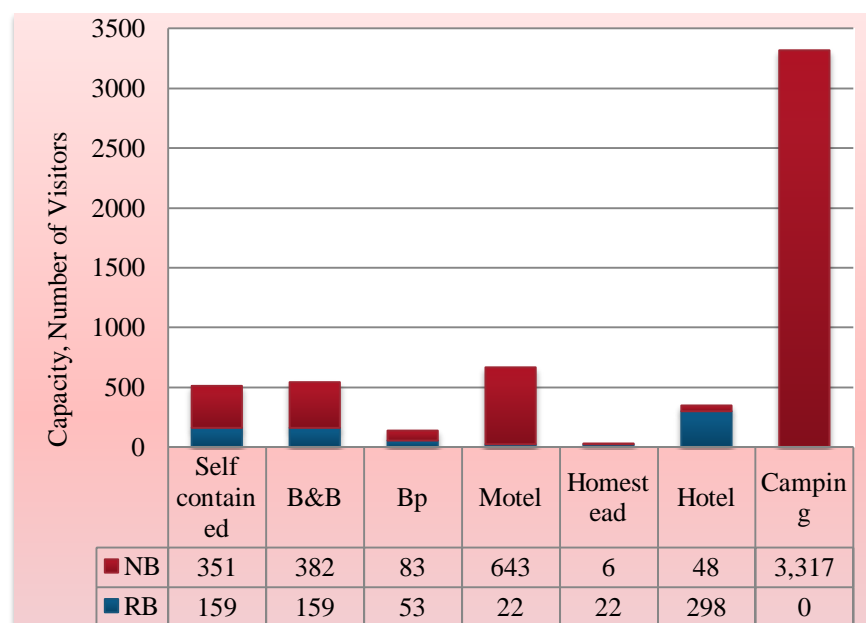


Figure 5.19: OCRT- capacity of RB and NB accommodation services – total capacity =5,543bed spaces (2011)

Furthermore, Table 5.15 and Figure 5.19 show that the majority (68.7%) 3,317 of 4,830 NB bed spaces (59.8% of 5,543 total bed spaces) are camping sites (powered and non-powered) followed by 13.3% (643) motel, 7.9% (382) B&B, and 7.3% (351) SC. Other types of NB bed spaces including Bp, homestead, and hotel are in a range 0.9-1.5% of total NB bed spaces.

5.6.3. OCRT Accommodation Services: Materials Used

Since the materials used in the construction of architecture are considered one of the main factors that makes a link between the building (and its users) and the surrounding environment, this research explores the types of materials used for constructing OCRT accommodation services. This exploration is conducted through using the related information and documents published in 210 official websites of OCRT accommodation services (Appendices 5 and 8). The main materials used for constructing each type of accommodation services (except camping sites) are set out in Appendix 5 and the summarised information shown in Appendix 8. As shown in Appendix 8, this information has been categorised into materials used by type, number and capacity of OCRT accommodation services in 2011.

Table 5.16: OCRT- accommodation services- materials used by types of accommodation, summary, (2011)

material(s)	Total bed spaces	%	Types of accommodation services											
			SC		B&B		Bp		Motel		Homestead		Hotel	
			No	C	No	C	No	C	No	C	No	C	No	C
Timber	1094	49.1	72	388	29	225	6	54	26	357	1	6	4	64
Timber and masonry	628	28.3	8	55	14	169	3	54	3	163	-	-	7	187
Mud brick (mixed with other materials)	79	3.5	5	33	4	26	1	6	-	-	1	6	1	8
Brick ¹ (mixed with other materials)	126	5.7	1	6	7	50	1	18	1	44	-	-	1	8
Stone ²	178	8	4	20	8	37	1	4	1	22	2	16	6	79
Concrete	113	5	-	-	4	34	-	-	2	79	-	-	-	-
Container	4	0.2	1	4	-	-	-	-	-	-	-	-	-	-
Caravan	4	0.2	1	4	-	-	-	-	-	-	-	-	-	-
Total	2,226	100	92	510	66	541	12	136	33	665	4	28	19	346

1. Brick includes: red brick, clay brick and brick.

2. Stone includes: schist stone, stone and rock.

• No= Number of accommodation services.

• C= Capacity (number of bed spaces).

This thesis classifies the types of materials used into the eight types of timber, timber and masonry, mud brick (mixed with other materials), brick (mixed with other materials), stone, concrete, container, and caravan (Table 5.16).

As shown in Table 5.16 and Figure 5.20, of the total 2,226 building based OCRT accommodation bed spaces the majority 49.1% (1,094) of bed spaces are in timber buildings followed by 28.3% (628) timber and masonry, 8% (178) stone, 5.7% (126) brick (mixed with other materials) and 5% (113) concrete. Other materials used including mud brick (mixed with other materials), container and caravan make up 0.2% - 3.5% of total (Table 5.16 and Figure 5.20).

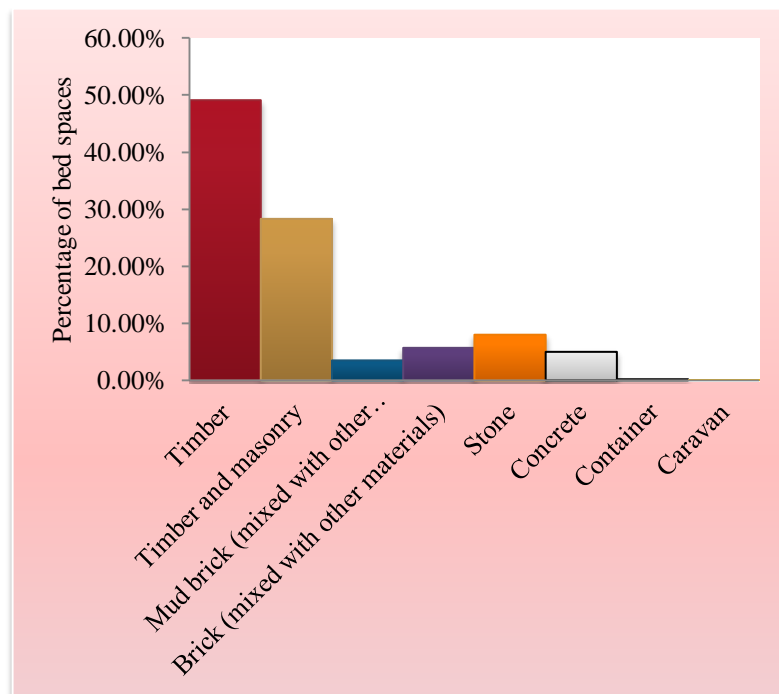


Figure 5.20: OCRT- accommodation – bed spaces by type of materials used (2011)

Table 5.16 and Figure 5.21 indicate that the SC accommodation services comprise 388 (76%) bed spaces using timber as the main construction material followed by 55 (10.8%) timber and masonry and 33 (6.5%) mud brick mixed with other materials. Bed spaces that are in buildings of other materials including stone, brick, concrete and caravan/container fall in the range of 4 (1.2%) – 20 (3.9%) out of total (Table 5.16 and Figure 5.21)

Table 5.16 and Figure 5.21 indicate that of 541 B&B bed spaces the majority or 225 use timber as main construction material, followed by 169 timber and masonry and 50 brick

(mixed with other materials). The numbers of B&B bed spaces of other materials including mud brick (mixed with other materials) and stone are between 26- 37 of the total bed spaces. As shown in Table 5.16 and Figure 5.21, 108 (79.4%) of 136 Bp bed spaces are constructed from timber and timber (mixed with other materials). The other 28 Bp bed spaces used materials including mud brick (mixed with other material, brick (mixed with other materials), stone and concrete, forming between 4 (3%) – 18 (13.20%) of total in this category (Table 5.16 and Figure 5.21).

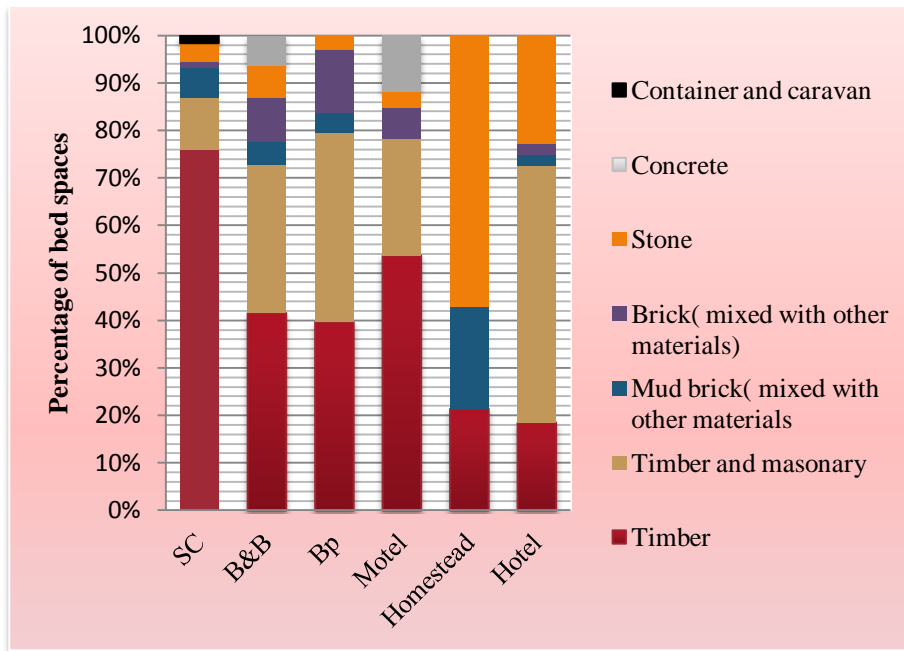


Figure 5.21: OCRT- accommodation services- materials used by type of accommodation (2011)

The majority of 357 (53.7%) motel bed spaces were built in timber followed by 163 (24.5%) timber and masonry, 79 (11.9%) concrete, 44 (6.6%) brick (mixed with other materials), and 22 (3.3%) stone (Table 5.16 and Figure 5.21). In contrast, of 28 homestead bed spaces, the majority of 16 (57.2%) were in stone followed by equal numbers of timber, and mud brick (mixed with other materials), at 6 (21.4%) each (Table 5.16 and Figure 5.21).

OCRT hotels comprise 346 bed spaces of which 187 (54%) are built of timber and masonry, 79 (22.8%) stone, and 64 (18.5%) timber (Table 5.16 and Figure 5.21). Other hotel bed spaces are equal in number between mud brick and brick mixed with other materials at 8 (2.3%) each (Table 5.16 and Figure 5.21).

5.6.4. OCRT Accommodation Services: Energy, Facilities and Spaces

As shown in Appendix 5 this research explores the energy sources and facilities used in 783 OCRT accommodation services through using information published on these accommodation websites. The sources of energy used are categorised into conventional and solar. The first category (heating and hot water) comprises electricity (EL), logs and gas and the second category contains solar systems, almost always used for water heating (Appendix 5). The facilities provided in OCRT accommodation services include a wide range of equipment (e.g. kitchen equipment, BBQ, TV, Internet, laundry, electric blanket, hair dryer, and log burner) as shown in Appendix 5. Likewise Appendix 5 contains data related to the available spaces (e.g. lounge, laundry, kitchen and kitchenette, veranda/balcony, outdoor sitting, bedroom, bathroom, and pool) in OCRT accommodation services.

This study classifies related information into the energy sources used, and facilities and spaces provided shown in Appendix 5 by types of OCRT accommodation services as shown in Appendices 9-16. In this research, all types of energy systems (EL, log, gas and solar) are explored in relation to types of accommodation services. However, for facilities and equipment, only the TV and Internet are chosen for analysis, as using these facilities can be considered as indicative of a modernised lifestyle (Appendices 9-16). Since using open air areas is proposed here as one of the environmental and cultural indicators for evaluating architecture as being sustainable because of the cultural link in New Zealand between indoor and outdoor areas and because these areas generally have low energy footprints in use, the veranda/balcony and outdoor seating are selected for further investigation in this study. The following section presents data classified by types of accommodation service as shown in Appendix 16 and summarises Appendices 9-15.

5.6.4.1. OCRT SC Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

Figure 5.22 and Appendix 16 demonstrate that of 510 SC bed spaces 422 (82.7%) use electricity for space or water heating. As shown in Figure 5.22 and Appendix 16, 279 (58.2%) of these 422 bed spaces are NB and 125 (24.5%) are RB. In addition, 146 (28.6%) SC bed spaces including 107 (21%) RB and 39 (7.5%) NB use logs, and 106 SC bed spaces comprising 54 (10.6%) RB and 52 (5.92%) NB use gas for heating. So

wood is more likely to be used in older buildings, as many of these may have come with chimneys and fireplaces.

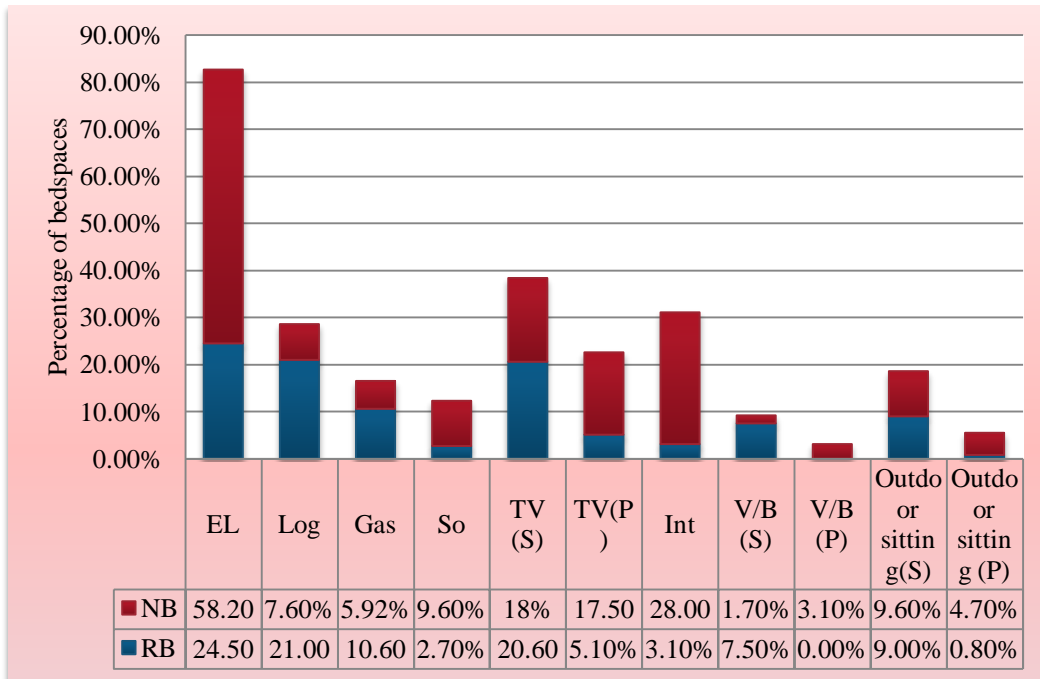


Figure 5.22: OCRT- SC accommodation services- energy source, facilities and spaces (2011)

- EL: Electricity
- So: Solar system
- TV (S): Shared TV
- TV (P): Private TV
- Int: Internet
- V/B (S): Shared veranda/ balcony
- V/B (P): Private veranda/balcony
- Outdoor sitting (S): Shared outdoor sitting
- Outdoor sitting (P): Private outdoor sitting

Figure 5.22 and Appendix 16 indicate that 63 (12.3%) of 510 SC bed spaces including 14 (2.7%) RB and 49 (9.6%) NB use a solar system, generally for water heating, showing that such systems can be fitted to existing buildings. In terms of equipment, 311 (61%) of 510 SC bed spaces have TV (shared and private). Furthermore, of the 311 (61%) SC bed spaces that have TV, 131 (25.7%) are RB and 180 (35.3%) are NB (Figure 5.22 and Appendix 16). Moreover, as shown in Figure 5.22 and Appendix 16, 159 (31.1%) SC bed spaces provide the Internet including 16 (3.1%) RB and 143 (28%) NB bed spaces. So in refurbished accommodation the TV is more likely to be provided than the Internet. In terms of outdoor space, 60 (11.76%) OCRT SC bed spaces have access to 16 verandas or balconies (both shared and private). These bed spaces are separated into 38 RB and 22 NB (Figure 5.22 and Appendix 16). Likewise, 123 (24.1%) SC bed

spaces including 50 (9.8%) RB and 73 (14.3%) NB have access to shared and private outdoor sitting areas (Figure 5.22 and Appendix16).

5.6.4.2. OCRT B&B Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

Figure 5.23 and Appendix16 demonstrate that of 541 B&B bed spaces 499 (82.7%) use electricity for heating. As shown in Figure 5.23 and Appendix16, 356 (65.8%) of these 499 bed spaces are NB and 143 (26.4%) are RB. In addition, of 136 (25.1%) B&B bed spaces 66 (12.2%) RB and 70 (12.9%) NB use logs, again showing refurbished buildings are more likely to use wood as an energy source. Of the remaining 37 B&B bed spaces 5 (0.9%) RB and 32 (5.9%) NB use gas for heating.

Figure 5.23 and Appendix 16 indicate that 12 (2.2%) NB of 541 B&B bed spaces have a solar water heating system. For equipment, 353 (65.2%) of 541 B&B bed spaces have TV (shared and private) made up of 85 (15.7%) RB and 268 (49.5%) NB bed spaces (Figure 5.23 and Appendix 16).

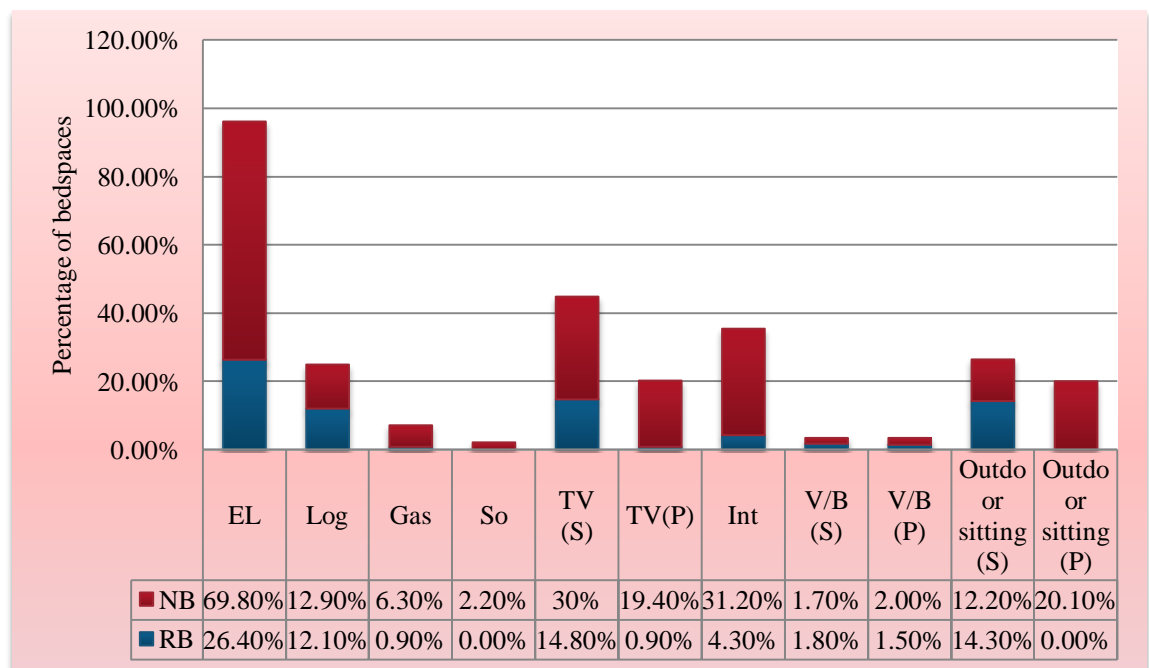


Figure 5.23: OCRT- B&B accommodation services- Energy sources, facilities and spaces (2011)

As demonstrated in Figure 5.23 and Appendix16, 182 (33.6%) B&B bed spaces are equipped with the Internet including 23 (4.2%) RB and 159 (29.4%) NB, again showing refurbished buildings are less likely to have the Internet. For outdoor space, 38 (7.2%) OCRT B&B bed spaces comprising 18 RB and 20 NB have 6 verandas and balconies

(both shared and private) (Figure 5.23 and Appendix16). Furthermore, some 248 (24.1%) of B&B bed spaces comprising 73 (13.5%) RB and 175 (32.3%) NB have access to shared or private outdoor sitting areas (Figure 5.23 and Appendix 16).

5.6.4.3. OCRT Bp Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

Figure 5.20 and Appendix16 demonstrate that of 136 Bp bed spaces 75 (55.1%) use electricity for heating. As shown in Figure 5.24 and Appendix 16, 65 (47.80%) of these 136 bed spaces are NB and 10 (7.30%) are RB. In addition, 6 (4.4%) Bp bed spaces that all are NB use logs and 18 (13.2%) NB Bp bed spaces use gas for heating. Figure 5.24 and Appendix16 indicate that 18 (13.2%) NB of 136 Bp bed spaces use solar water heating. For equipment 33 (24.3%) of 136 BP bed spaces have TV (shared and private) including 8 (5.9%) RB and 25 (18.4%) NB bed spaces (Figure 5.24 and Appendix 16). Furthermore, as demonstrated in Figure 5.24 and Appendices 16, 18, 13.2% of Bp beds spaces provide the Internet and are NB.

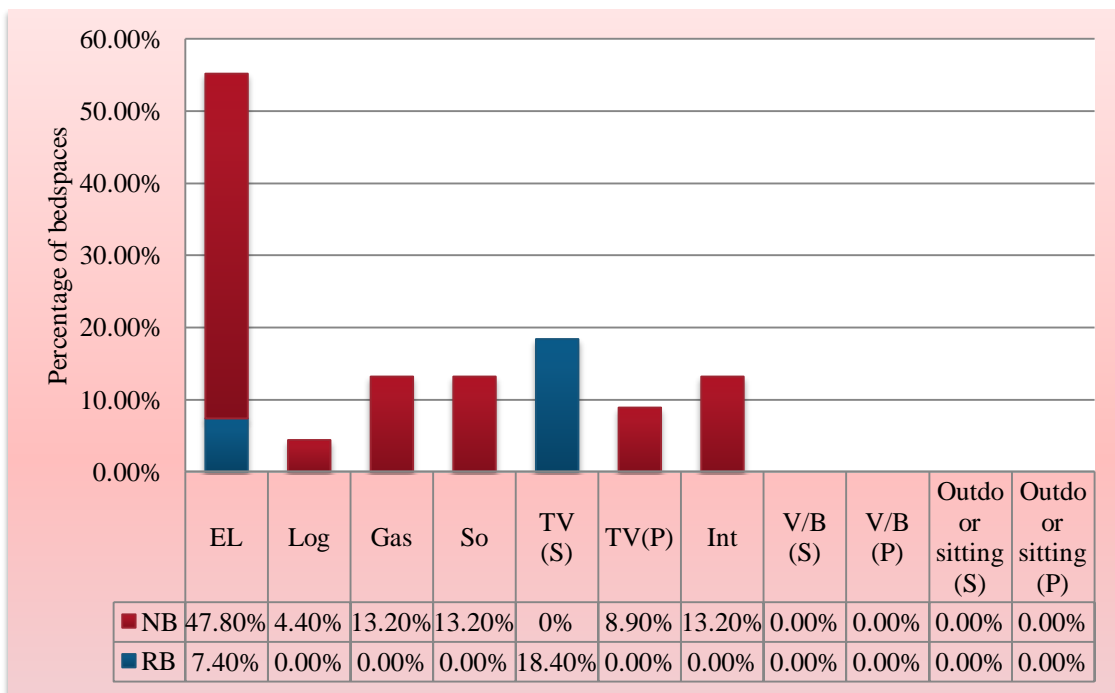


Figure 5.24: OCRT- Bp accommodation services- energy sources and facilities (2011)

5.6.4.4. OCRT Motel Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

Figure 5.25 and Appendix16 indicate that of 665 motel bed spaces 508 (76.4%) made up of 22 (3.3%) RB and 486 (73.1%) NB use electricity for heating. For equipment, 611 (91.9%) of 665 motel bed spaces have TV (shared and private) and all are NB (Figure 5.25 and Appendix 16). Moreover as shown in Figure 5.25 and Appendix 16, 582(87.5%) motel bed spaces have access to the Internet and all are NB. motels are dominated by NB.

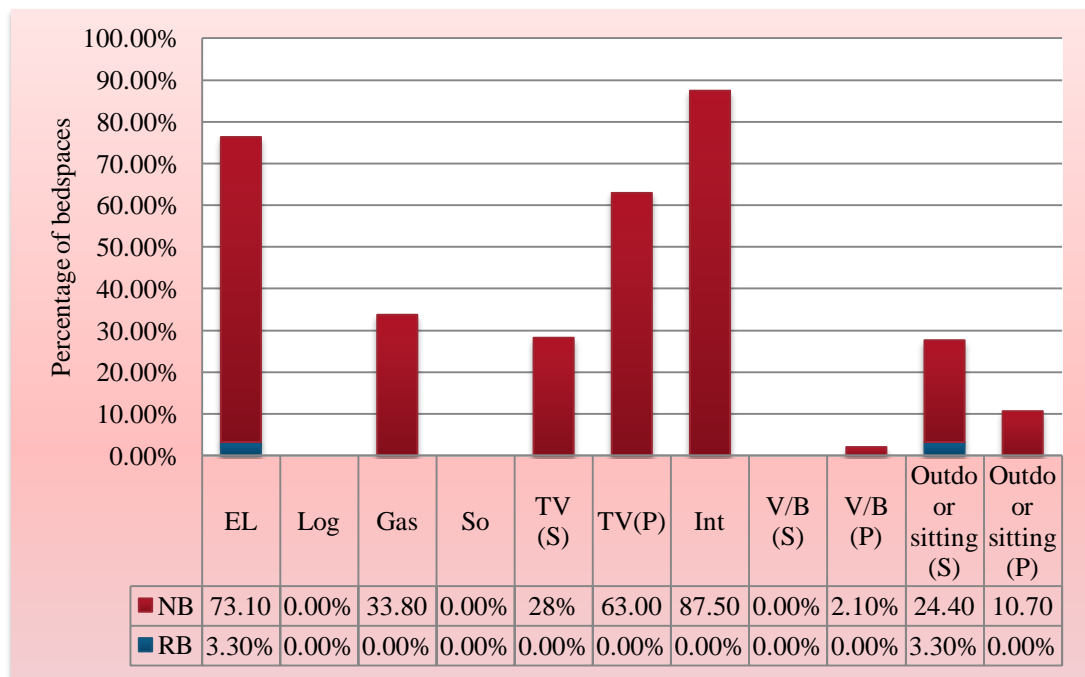


Figure 5.25: OCRT- Motel accommodation services- energy sources and facilities (2011)

As shown in Figure 5.25 and Appendix16, only 14 (2.1%) NB OCRT motel bed spaces can access 2 private verandas. However, 255 (39%) of motel bed spaces comprising 22 (3.4%) RB and 233 (35.6 %) NB have access to shared and private outdoor sitting areas (Figure 5.25 and Appendix16).

5.6.4.5. OCRT Homestead Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

As demonstrated in Figure 5.26 and Appendix 16, all 28 homestead bed spaces made up of 22 (78.6%) RB and 6 (21.4%) NB use electricity for heating. In addition these figures show that 4 (14.3%) RB homestead bed spaces also use logs to heat part of the accommodation services, in particular common spaces such as living rooms and guest lounge

areas. This again underlines that log burning is more likely to be associated with refurbished accommodation.

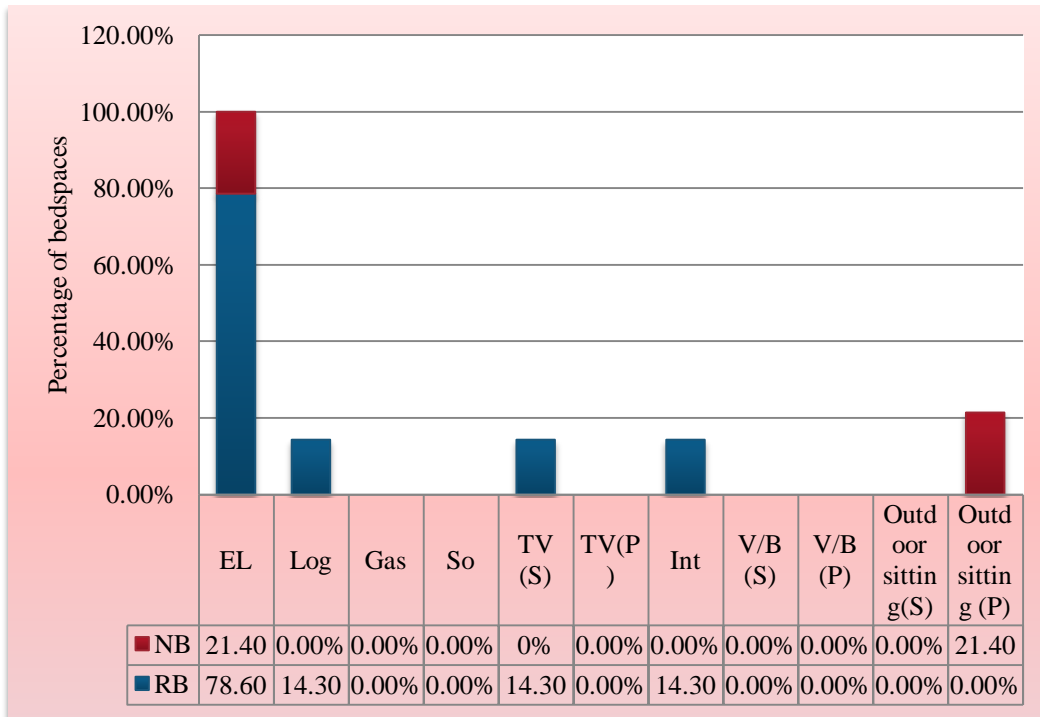


Figure 5.26: OCRT- Homestead accommodation services- energy sources and facilities (2011)

Figure 5.26 and Appendix16 show that 4 (14.3%) out of 28 homestead bed spaces have a shared TV and all are RB. Likewise as shown in Figure 5.26 and Appendix16, 4 (14.3%) of RB homestead bed spaces have access to the Internet and 6 (21.4%) of NB bed spaces have use of a private outdoor sitting area.

5.6.4.6. OCRT Hotel Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

As shown in Figure 5.27 and Appendix16, 303 (87.6%) out of 346 OCRT hotel bed spaces that are RB use electricity for heating. Furthermore, 90 (26%) hotel bed spaces including 84 (24.3%) RB and 6 (1.7%) NB have log burning facilities and 29 (8.4%) RB bed spaces use gas for heating.

As indicated in Figure 5.27 and Appendix16, 158 (45%) RB hotel bed spaces have access to 8 shared TVs and 81 (23.4%) RB bed spaces have access to the Internet. Moreover as shown in Figure 5.27 and Appendix16, 43 (12.4%) of RB bed spaces have use of 3 shared verandas. Also, of 73 (21.1%) RB bed spaces, 44 have access to 3 shared outdoor sitting areas and 29 can use 6 private outdoor sitting spaces (note, this is

bed spaces, and there is usually more than one bed space per room) (Figure 5.27 and Appendix 16). It seems the refurbished hotels are continuing the New Zealand tradition of providing indoor and outdoor spaces.

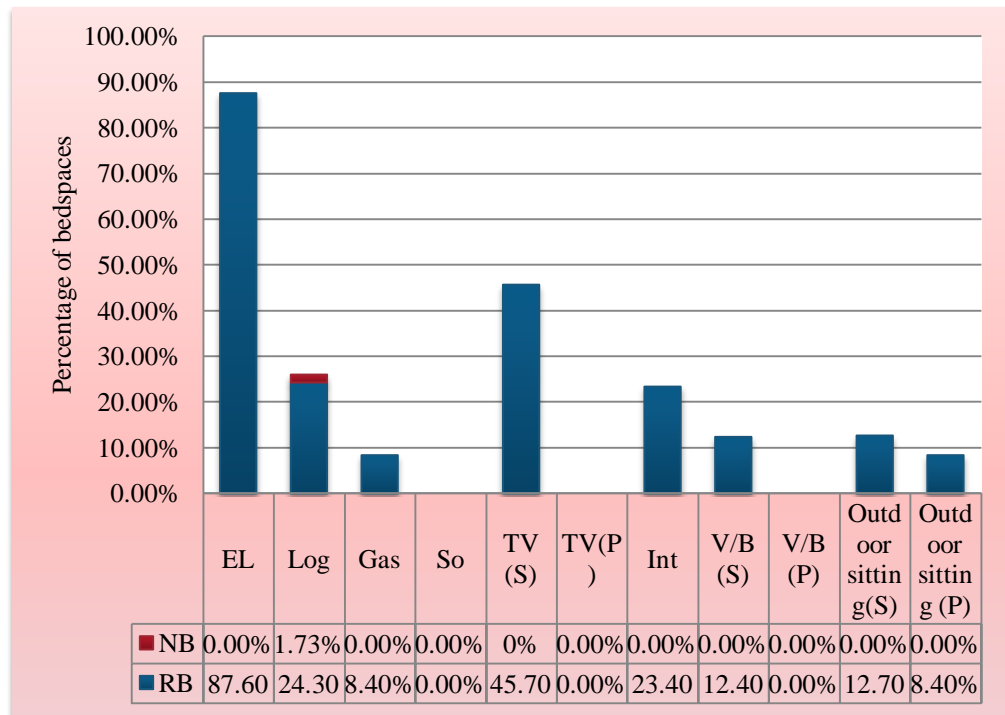


Figure 5.27: OCRT- Hotel accommodation services- Energy sources and facilities (2011)

5.6.4.7. OCRT Camping Sites: Energy Sources, Facilities and Open Air Spaces (2011)

As shown in Figure 5.28 and Appendix16, of 3,317 OCRT camping sites, 2,048 (61.7%) are powered sites with electricity and a surprising 3,114 (93.9%) have access to the Internet (almost all wireless). The old New Zealand tradition of the simple family camping holiday seems to have changed.

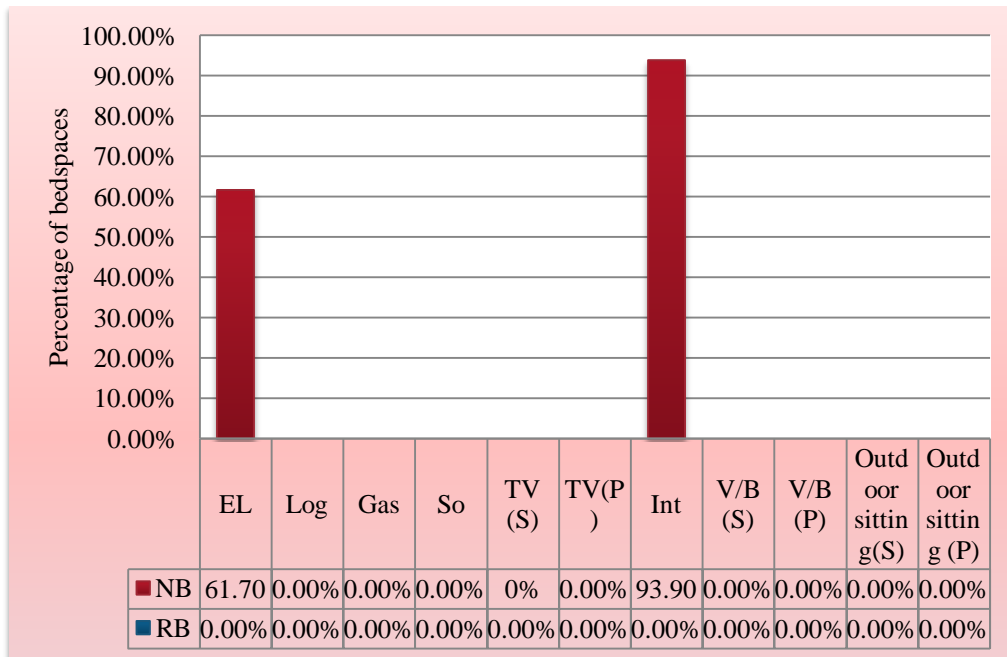


Figure 5.28: OCRT- camping site accommodation services- energy sources and facilities (2011)

5.6.4.8. All Types of OCRT Accommodation Services: Energy Sources, Facilities and Open Air Spaces (2011)

Figure 5.29 indicates the energy resources used, facilities and open air spaces in all types of OCRT accommodation services. It shows of 5,496 OCRT bed spaces, 3,233 (58.80%) NB and 621 (11.30%) RB use electricity for heating, also 121 (2.2%) NB and 258 (4.7%) RB use logs for heating, 324 (5.9%) NB and 88 (1.6%) RB use gas, and 77 (1.4%) NB and 16 (0.3%) RB use a solar system for heating water.

When it comes to equipment, Figure 5.29 shows that of 5,496 OCRT bed spaces, 401 (7.3%) RB and 687 (12.5%) NB bed spaces have TV (shared and private) and only 121 (2.2%) RB have access to the Internet compared with 3,985 (72.5%) NB bed spaces. As indicated in Figure 5.29, 278 (5.60%) RB and 539 (9.80%) NB bed spaces use shared and private outdoor sitting areas (including verandas, balconies and open air sitting spaces).

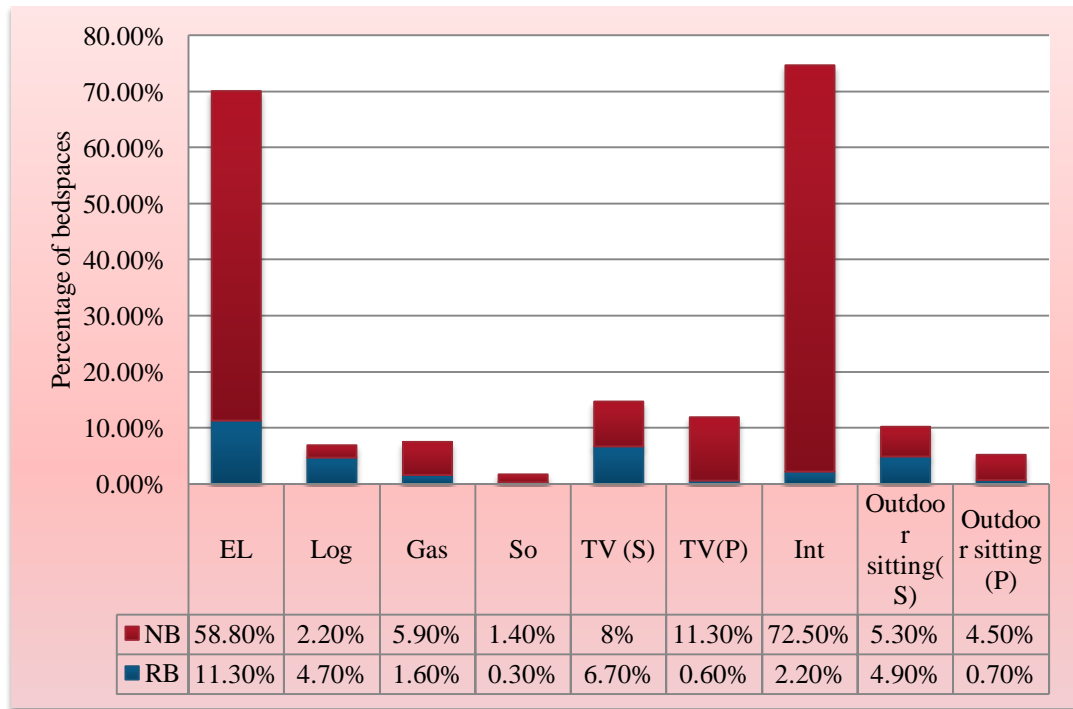


Figure 5.29: OCRT- all types of accommodation services- energy sources, facilities and open air spaces (2011)

5.6.4.9. OCRT Accommodation Services: Comparison between NB and RB Bed spaces in terms of Energy Sources, Facilities and Open Air Spaces (2011)

Figure 5.30 compares OCRT NB and RB bed spaces for use of energy resources, facilities and outdoor sitting. As demonstrated, 66.5% of NB and 87% of RB bed spaces use electricity for heating. However, only 2.5% of NB have facilities for log burning compared to 36.20% of RB bed spaces. Use of gas is more even with 6.70% of NB and 12.30% of RB bed spaces using it for heating. Figure 5.30 also indicates that 1.60% of NB and 2.40% of RB bed spaces use a solar system for heating water, showing that both types of buildings can accommodate more sustainable technologies.

Figure 5.30 also shows that 14.22% of NB and 56% of RB bed spaces provide a TV, but it should be remembered that the NB bed spaces include 3,317 camp bed spaces that do not provide TV. In terms of using the Internet, 82.50% of NB and only 17% of RB bed spaces have access to the web (Figure 5.30). In contrast, when it comes to outdoor spaces only 11.15% of NB can access outdoor sitting areas compared to 39% of RB OCRT bed spaces. There are some clear differences in what visitors can expect to find in the different types of accommodation.

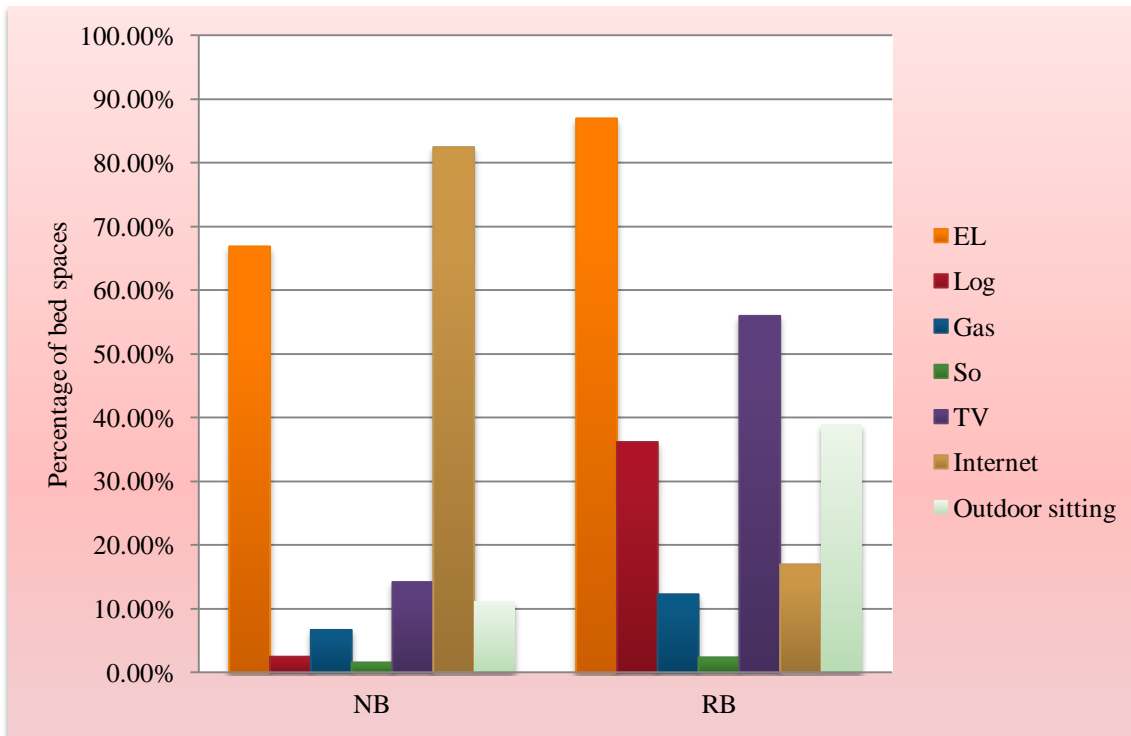


Figure 5.30: Comparison between OCRT- NB and RB accommodation bed spaces in terms of energy sources, facilities and open air spaces

5.6.5. OCRT Accommodation Services: Occupancy Share

Table 5.17 presents the calculated occupancy rates of Central Otago accommodation services (2010 and 2011) as published by New Zealand Statistics (2011:5). This table determines the occupancy rate of motels/apartments at 43.1% and holiday parks at 10.1% in 2010. Moreover, the overall occupancy rate of accommodation services including holiday parks in 2010 is estimated to be 14.9%. In addition total occupancy rate of types of accommodation services excluding holiday parks is estimated to be 31%. (Table 5.17). The “occupancy rates excluding holiday parks are included because the capacity of holiday parks can distort total occupancy rates”. (New Zealand Statistics, 2011:5).

The occupancy rate of Central Otago motels dropped to 41.1% in 2011. In addition, as shown in Table 5.17, the occupancy rate of Central Otago holiday parks also dropped from 10.1% to 9.4% in 2011. The overall occupancy rates of Otago Central accommodation including holiday parks and excluding holiday parks dropped to 14.3% and 30.4% respectively in 2011 (Table 5.17).

Table 5.17: Central Otago accommodation variables by accommodation type and year

Occupancy rates ⁽¹⁾ (%)		
Type of accommodation	Annual	
	Year ended	
	September 2010	September 2011
Hotels ²	C	C
Motel ² / apartments	43.1	41.1
Backpackers ²	C	C
Holiday parks ²	10.1	9.4
Total ²	14.9	14.3
Total excluding holiday parks ² .	31	30.4

1. Occupancy rates are calculated as the ratio of visitor occupied unit nights to monthly capacity
2. Hotels: includes both hostels and resorts
3. Motels: includes motor inns, apartments and motels.
4. Backpackers: includes Backpackers/hostels
4. Holiday parks: includes Caravan parks/camping grounds
C to be calculated

- Reference: Statistics New Zealand, Central Otago, September 2011:5

Since the occupancy rates of Central Otago hotels, backpacker, self-contained and homestead accommodation are not available in New Zealand Statistics (2011), to obviate this shortage of information, this study uses the occupancy share of OCRT accommodation services in 2005, from Department of Conservation (DOC) (June 2011) as shown in Table 5.18.

Table 5.18 indicates that the occupancy share of hotel/ motel in OCRT is 32% followed by B&B (27%), motor home/ camping (24%), backpackers (14%) and own home/ holiday home/ friends and relatives (3%).

Table 5.18: OCRT- Occupancy share by type of accommodation service

Types	% of visitor nights (2005) ¹
Hotel/Motel	32
B&B	27
Motor home/Camping	24
Backpackers	14
Own home/Holiday home/friends and relatives	3
Total	100

1. Reference: OCRT, 2005:10

- Total visitor numbers in 2005= 8,923 (Department of Conservation, June 2011)

This thesis uses the occupancy share cited in Table 5.18 to measure the occupancy of all OCRT accommodation types in 2011. The occupancy share of hotel/motel which is 32% in 2005 (Table 5.18) is separated into the two occupancy shares of hotel (10.9%) and motel (21.1%) in 2011 (Table 5.19) based on the following discussion.

As indicated in Table 5.14, in 2011 the OCRT motels and hotels contain 665 and 346 bed spaces respectively, making 1011 in total. In 2011, the 665 OCRT motel bed spaces comprise 65% of total (1011) motel/hotel bed spaces. In addition, 346 OCRT hotel bed spaces make up 34.2% of total (1011) motel/hotel-bed spaces in 2011. This study uses these proportions to divide the 32% occupancy of motel/hotel (cited in Table 5.18) into the two occupancy shares of 21.1% (65% of 32) motel and 10.9% (34.2% of 32) hotel (Table 5.19).

Table 5.19: OCRT- accommodation services- occupancy shares (2011)

Type of accommodation service	% of visitor nights (2005)	Visitor nights (2011)	Available bed spaces	100% occupancy per year ¹
SC	13.1	5,559	510	186,150
B&B	13.9	5,899	541	197,465
Bp	14	5,941	136	49,640
Motel	21.1	8,954	665	24,2725
Homestead	3	1,273	28	10,220
Hotel	10.9	4,626	346	126,290
Camping	24	10,185	3,317	1,210,705
Total	100	42,437	5,543	2,023,195

1. 100% occupancy rate of each type of accommodation service / year= number of available bed spaces × 365 (days)

Since this thesis uses the occupancy shares of OCRT accommodation services proposed by Department of Conservation (2011- see Table 5.18) as basic data in which the occupancy share of the OCRT self-contained accommodation services is not included, the occupancy share of SC accommodation service in 2011 is calculated through the following discussion.

As demonstrated in Table 5.18, the occupancy share of B&B accommodation services is 27% in 2005. This research makes this assumption that in 2005 B&B occupancy share contains both occupancy shares of B&B and SC accommodation services. Based on this assumption, the 27% occupancy of B&B accommodation in 2005 (see Table 5.18) is divided into the two portions of B&B and SC occupancy shares according to the percentage of their available bed spaces in 2011 through the following explanation.

As shown in Table 5.14, OCRT SC and B&B accommodation services comprise respectively 510 (48.5%) and 541(51.5%) of the total 1051 (510 +541) SC/B&B bed spaces in 2011. This thesis divides the 27% occupancy share of B&B accommodation calculated

in 2005 (see Table 5.18) into the two portions of 13.1% (48.5% of 27) SC and 13.9% (51.5% of 27) B&B accommodation (Table 5.19).

Furthermore, the occupancy share of OCRT homestead accommodation in 2011(3%) is assumed as equal to own home/holiday home/friends and relatives occupancy share calculated in 2005 (Tables 5.18 and 5.19). The total of OCRT visitor nights (42,437) is multiplied by the occupancy share of each type of accommodation services to calculate their related visitor nights (Table 19).

5.6.6. OCRT Accommodation Services: Area

This chapter calculates the areas of a representative sample of 41 of the OCRT accommodation services buildings (21RB and 20NB) made up of 10 SCs, 13 B&Bs, 4Bps, 5 motels, 2 homesteads and 7 hotels and their area per bed space (m^2) to calculate an average area per bed space for each type of accommodation service used in OCRT (Appendix 18). The area of each of the 41 accommodation services is calculated using Map Tool2 for floor area calculation and scaled elevation based on information published in the websites and satellite Google Maps.

The resulting information shown in Appendix 18 is summarised in the following Table 5.20 determines the capacity (C), floor area and area per bed space of the chosen types of OCRT accommodation and their numbers. As shown in Table 5.20, the largest area of building per bed space is in B&B at $40m^2$ followed by a similar group of just under $30m^2/bed$ ($29.5m^2/bed$ SC, $29.4 m^2/bed$ homestead, and $29.1 m^2/bed$ hotel), with a smaller area of $16.9 m^2/bed$ for motel and, as might be expected, the lowest area of $12 m^2/bed$ for Bp.

Table 5.20: OCRT- average area per bed by type of accommodation (2011)

Category	No.	C	Floor space m^2	Area per Bed m^2
SC	10	61	1,817	29.5
B&B	13	93	3,436	40
Bp	4	58	697	12
Motel	5	166	2,812	16.9
Homestead	2	353	12	29.4
Hotel	7	156	4,538	29.1
Camping ¹	-	-	-	6
Total	41	887	13,312	-

1. The average area of camping sites is assumed $6m^2$ per bed space

Table 5.21 shows the average area, number of bed spaces and total area of each type of OCRT accommodation service and whether they are NB or RB (called here quality or Q). In this table the area of each type of accommodation services is calculated as its average area/bed space multiplied by the number of bed spaces.

Comparing the areas of types of NB OCRT accommodation services, camping sites comprise the majority or 19,902 m² followed by B&B (15,280m²), motel (10,866.7m²) and SC (10,354.5m²) (Table 5.21). Other types of NB accommodation services including Bp, hotel and homestead contain areas in a range of 176.4-1,396.8 m² (Table 5.21). In addition, RB hotels contain the largest RB area of 8,671m² followed by B&B (6,360 m²) and SC (4,690.5 m²). The areas of other refurbished accommodation services including Bp, hotel and homestead are between 371.8- 646.8 m² (Table 5.21).

Category	Q	Average area/bed space (m ²)	Bed space	Area (m ²)
SC	NB	29.5	351	10,354.5
	RB	29.5	159	4,690.5
B&B	NB	40	382	15,280
	RB	40	159	6,360
Bp	NB	12	83	996
	RB	12	53	636
Motel	NB	16.9	643	10,866.7
	RB	16.9	22	371.8
Homestead	NB	29.4	6	176.4
	RB	29.4	22	646.8
Hotel	NB	29.1	48	1,396.8
	RB	29.1	298	8,671.8
Camping site	NB	6	3,317	19,902
	RB	-	0.00	-
Total	-	-	5,543	80,350

The total area of OCRT NB accommodation services is 58,972 m² and RB accommodation is 21,378 m², making a total of 80,350 m² (Table 5.22.).

Quality of buildings	Area (m ²)
NB buildings	58,972
RB buildings	21378
Total	80,350

5.6.7. OCRT Accommodation Services: Occupied Area

Table 5.23 demonstrates that OCRT B&B accommodation services have the largest occupied area of 235,960 m², followed by SC (163,990 m²), motel (151,322.6 m²) and hotel 134,616.6 m². Bp and homestead contain smaller areas at 71,292 m² and 37,426.2 m² respectively (Table 5.23). The occupied area (m²/year) of each type of accommodation as shown in Table 5.23 is calculated through the following steps:

Occupancy share of each type × Total OCRT visitor nights = Visitor nights of each type

Visitor nights/year × Area/bed (m²) = Occupied area (m²)/year

5.6.7.1. Example: SC Occupied Area (m²) / year (2011)

13.1% (occupancy share) × 42,437 (total OCRT visitor nights) = 5,559 (SC visitor nights)

5,559 (SC visitor nights) × 29.5 (m²/bed) = 163,990.5 m²/year Occupied Area (2011)

Type	No.	C	Area per bed m ²	Total Area	Occupancy share (%)	Visitor nights	Occupied Area m ² /year (2011)
SC	92	510	29.5	15,045	13.1	5,559	163,990.5
B&B	66	541	40	21,640	13.9	5,899	235,960
Bp	12	136	12	1,632	14	5,941	71,292
Motel	33	665	16.9	11,238.5	21.1	8,954	151,322.6
Homestead	4	28	29.4	823.2	3	1,273	37,426.2
Hotel	19	346	29.1	10,068.6	10.9	4,626	134,616.6
Camping	557	3,317	6	19,909	24	10,185	-
Total	783	5543		80,350	100	42,437	794,608

5.6.8. The EF of OCRT Accommodation Services

This section explores the EF of OCRT accommodation services through using three scenarios. In the first scenario, all buildings are assumed to be new buildings (NB) and in the second scenario the buildings include both NB and RB accommodation as currently found in the ORCT. However, in the first and second scenario all areas of buildings (indoor and outdoor spaces including verandas and balconies) are assumed to have the footprint of indoor spaces. In the third scenario that reflects the current position of OCRT accommodation services, the buildings include NB and RB accommodation and spaces that are both indoor and open air (veranda and balcony) areas.

In the first scenario (5.6.8.1) the calculation of the EF of OCRT accommodation is conducted through measuring: the embodied energy of each type of (a1 to a9); the operation energy use of each type of OCRT accommodation services (b); and, the lifecycle energy use of the accommodation (c). Section 5.6.8.2-d calculates the total EF of OCRT accommodation services based on the first scenario discussed above. Sections 5.6.8.2 and 5.6.8.3 calculate the EF of OCRT accommodation services based on the second and third scenarios.

Comparison between the EFs from the first and second scenarios can indicate the influence exerted on the EF of OCRT accommodation services by using refurbished buildings. In addition, comparison between the EFs of the second and third scenarios determines the influence of using open air spaces on the EF of OCRT accommodation services.

5.6.8.1. First Scenario: All Buildings are assumed to be New Buildings

a. Embodied Energy

Table 5.24 comprises the calculated embodied energy of New Zealand building materials including ceramics, ready mix concrete and stone, as calculated by Alcorn (1996 and 2003) and Alcorn and Wood (1998).

Table 5.24: Embodied energy coefficient of New Zealand building materials.

Material		Alcorn 1996		Alcorn and Wood 1998		Alcorn 2003	
		MJ/kg	MJ/m ³	MJ/kg	MJ/m ³	MJ/kg	MJ/m ³
Ceramic	Brick, new technology	2.5	5,170	2.5	5,170	2.7	5,310
	Brick, old technology	-	-	7.7	1,580	6.7	13,188
Ready mix Concrete	17.5 MP a	1	2,350	1	2,350	0.9	2,019
Stone	Local	0.79	1,890	0.79	1,890	-	-
	imported	6.8	17,610	6.8	17,610	-	-

• Reference: Mithraratne et al, 2007: 215-216

Table 5.25 classifies NZ residential building construction into the two types of light and heavy constructions and gives the embodied energy of the building elements used in each type of structure. According to Mithraratne et al (2007: 159) the embodied energy of walls (see Table 5.25) used in two types of light and heavy construction are calculated based on this assumption (which arises from their research) that 30% of the areas of external walls are covered by windows. This research uses this assumption (30% of external walls covered by windows) to calculate the embodied energy of walls with mud brick, brick, stone and concrete in OCRT accommodation.

As most of OCRT refurbished buildings with mud brick, brick, stone and timber structure (see Appendix 5) dominantly use timber frame windows, for calculation of the embodied energy uses of these types of construction, the windows are assumed with timber frame. Moreover, as most of the NB buildings with concrete construction dominantly use windows with aluminium frame (see Appendix 5), the embodied energy use of this type of construction is calculated based on this assumption that 30% of the area of external walls are covered by windows with aluminium frames.

This study uses the information in Tables 5.23 and 5.24 to calculate the embodied energy of OCRT accommodation services by type of construction as shown in Table 5.25.

Table 5.25: Initial embodied energy intensities for BIAC standard house

Building element	Embodied energy intensity (MJ/m ²)			
	Light construction		Heavy construction	
Foundation	30	2%	80	3%
Floor	220	12%	740	28%
Walls ¹	450	25%	820	31%
Roof	400	22%	340	13%
Joinery	230	13%	230	9%
Electrical work	100	5%	100	4%
Plumbing	170	9%	170	6%
Finishes	210	12%	160	6%
Total	1,810	100%	2,640	100%

1. 30% of walls covered by windows (Mithraratne et al, 2007: 154)

• Reference: Mithraratne et al, 2007: 159

Table 5.26 contains the calculated embodied energy of OCRT accommodation services by types of construction through the measurement of the embodied energy of wall, roof, floor and foundation as used in each type of construction.

a. 1. OCRT Accommodation Services with Timber Structure: Embodied Energy

As shown in Table 5.26, the embodied energy of walls (30% covered by windows), roofs, floors and foundations used in an OCRT timber structure are assumed to have equal GJ/m² (and MJ/m² embodied energies) to the light construction in Table 5.25.

a. 2. OCRT Accommodation Services with Timber and Masonry Structure: Embodied Energy

Table 5.26 determines that OCRT timber and masonry type of construction uses timber frame, brick veneer for walls, timber frame for roofs and floors, and light foundations. The embodied energy for OCRT timber frame and brick veneer wall (Table 5.26) is assumed to be equal with the embodied energy for heavy construction walls (30% covered by windows) cited in Table 5.25 (0.82 GJ/m²). Furthermore, the embodied energy for roofs and floors (Table 5.26) are assumed to be equal with the embodied energy for heavy construction roofs and floors in Table 5.25. (0.34 GJ/m² and 0.74 GJ/m² respectively).

Table 5.26: Initial embodied energy intensities for OCRT- accommodation services by type of construction.

Type of construction	Wall	GJ per m ²	Roof	GJ per m ²	Floor	GJ per m ²	Foundation	GJ per m ²
Timber	Timber	0.45	Timber frame	0.4	Timber Frame	0.22	(Light construction)	0.03
Timber and masonry	Timber frame, brick veneer	0.82	Timber frame (light construction)	0.4	Timber	0.74	Heavy construction	0.08 ¹
Mud brick (mixed with other materials)	Mud brick* ¹	0.18	Timber frame (light construction)	0.4	Heavy construction	0.74	Heavy construction	0.08 ¹
Brick mixed with other materials (old technology)	Brick ²	3.9	Timber frame (light construction)	0.4	Heavy construction	0.74	Heavy construction.	0.08
Brick mixed with other materials (new technology)	Brick (0.35 m wide ×3m high)	1.8	Timber frame (light construction)	0.4	Heavy construction	0.74	Heavy construction.	0.08
Stone ³ (local)	Stone (0.4m wide ×3m high)	0.36	Timber frame (light construction)	0.4	Heavy construction	0.74	Heavy construction.	0.08
Stone ³ (imported)	Stone (0.4m wide ×3m high)	5.75	Timber frame (light construction)	0.4	Heavy construction	0.74	Heavy construction.	0.08
Concrete ⁴	Ready mixed concrete (0.2m wide×3m high)	1.93	Timber frame (light construction)	0.4	Heavy construction	0.74	Heavy construction.	0.08

1. Mud brick wall 0.35m wide and 3m high in 100m² building (only exterior walls calculated) = 40.5 m³ = 0.4 m³/m²

2. Brick wall 0.35m wide and 3m high in 100m² building (only exterior walls calculated) = 40.5 m³ = 0.4 m³/m²

3. Stone wall 0.4m wide and 3m high in 100m² building (only exterior walls calculated) = 46.1 m³ = 0.46 m³/m²

4. Concrete wall 0.2m wide and 3m high in 100m² building (only exterior walls calculated) = 23.5 m³ = 0.2 m³/m²

*Reference: Australia's guide to environmentally sustainable homes. www.yourhome.gov.au/technical/fs52.html

a. 3. OCRT Accommodation Services with Mud Brick Structure: Embodied Energy

As shown in Table 5.26, the type mud brick (mixed with other materials) uses mud brick walls the embodied energy of which is calculated through the following steps:

1. Embodied energy of mud= 0.0016 MJ/kg (Chel and Tiwari, 2009:1968)
2. The weight of 1m³ mud packed = 1, 906 kg (www. simetric.co.UK)
3. Embodied energy of 1m³ mud packed = 1,906 × 0.0016 = 3.05 MJ/m³ = 0.003 GJ/m³
4. Mud brick wall 0.35m wide and 3m high in 100 m² building (exterior walls only) and assuming windows occupy 30% of total area of exterior walls (36 m² of 120 m²) = 27.9 m³ = 0.28 m³/m²
5. Embodied energy of mud brick wall 0.35 m wide and 3 m high in 100 m² building assuming windows occupy 30% of total area of exterior walls (36 m² of 120 m²) = 27.9 m³ (mud brick) × 0.003GJ /m³ = 0.084 GJ/100 m² = 0.00084 GJ/m²

6. Embodied energy of timber frame window ($1.2\text{m}^2 \times 1.2\text{m}^2$) = 738 MJ = 0.74 GJ
7. Embodied energy of 1m^2 timber frame window = $512.5 \text{ MJ/m}^2 = 0.51 \text{ GJ/m}^2$
8. Embodied energy of 36 m^2 (30% exterior wall area) timber frame window/100 m^2 (building area) = $18.36 \text{ GJ}/100 \text{ m}^2 = 0.18 \text{ GJ/m}^2$
9. Embodied energy mud brick wall 0.35 m wide and 3m high in 100 m^2 building including windows = $0.18 \text{ GJ/m}^2 + 0.00084 \text{ GJ/m}^2 = 0.1808 \text{ GJ/m}^2 \sim 0.18 \text{ GJ/m}^2$

In Table 5.26, the embodied energy of roofs in OCRT mud brick construction is assumed equal with the embodied energy of light construction roofs (0.4 GJ/m^2) in Table 5.25. Moreover, in this type of OCRT construction, the embodied energy for floors and foundations are assumed equal with the embodied energy for heavy construction floor and foundation (0.74 GJ/m^2 and 0.08 GJ/m^2 respectively) as shown in Table 5.25.

a. 4. Brick (Old Technology) Mixed with Other Material

Since most of the OCRT accommodation buildings with brick construction are RB and historic buildings and used old technology to produce brick (see Appendix5) this study considers brick (old technology) as the dominant used material for brick construction. Moreover, as most of the buildings with brick construction use brick wall as bearing wall through using old technology the average width of this type of wall is considered to be 0.35m.

In Table 5.26, the embodied energy of a brick wall (old technology) is calculated through the following steps:

1. Embodied energy of brick (old technology) = $13,188 \text{ MJ/m}^3 = 13.188 \text{ GJ/m}^3$ (reference: Mithraratne et al, 2007: 215)
2. Brick wall 0.35 m wide and 3 m high in 100 m^2 building for exterior walls assuming windows occupy 30% (36 m^2 of 120 m^2) the area of exterior walls = $27.9 \text{ m}^3 = 0.28 \text{ m}^3/\text{m}^2$ (house area)
3. Embodied energy of a brick wall 0.35m wide and 3m high in 100 m^2 building excluding the windows = 27.9 m^3 (brick) $\times 13.188 \text{ GJ/m}^3 = 368 \text{ GJ}/100\text{m}^2 = 3.68 \text{ GJ/m}^2$
4. Embodied energy of 36m^2 timber frame windows (as above) = $18.36 \text{ GJ}/100 \text{ m}^2 = 0.18 \text{ GJ/m}^2$
5. Total embodied energy of a brick (old technology) wall 0.35 m wide and 3m high in 100 m^2 building with windows = $0.18 \text{ GJ/m}^2 + 3.68 \text{ GJ/m}^2 = 3.86 \text{ GJ/m}^2 \sim 3.9 \text{ GJ/m}^2$

In Table 5.26, the embodied energy of roofs in OCRT brick (old technology) construction is assumed equal to the embodied energy of light construction roofs (0.4 GJ/m^2) in Table 5.25. In addition, in this type of OCRT construction, the embodied energy for floors and foundations are assumed equal with the embodied energy for heavy construction floor and foundations (0.74 GJ/m^2 and 0.08 GJ/m^2 respectively) as shown in Table 5.25.

a. 5. Brick (New Technology) Mixed with Other Material

Although in OCRT accommodation services with brick construction, the buildings are RB and historic buildings (see Appendix 5) and use brick (old technology), this thesis also calculates embodied energy of brick (new technology) building to be compared with the embodied energy of brick (old technology).

In Table 5.26, the embodied energy of a brick wall (new technology) is calculated through the following steps:

1. Embodied energy of brick (new technology) = $5,310 \text{ MJ/m}^3 = 5.31 \text{ GJ/m}^3$ (reference: Mithraratne et al, 2007: 215)
2. A brick wall 0.35m wide and 3m high in 100m^2 building assuming the windows occupy 30% (36 m^2 of 120 m^2) of the exterior walls = $27.9 \text{ m}^3 = 0.28 \text{ m}^3/\text{m}^2$ (house area)
3. The embodied energy of a brick wall 0.35 m wide and 3m high in 100 m^2 building excluding windows that cover 30% (36 m^2 of 120 m^2) of the exterior walls = $27.9\text{m}^3(\text{brick}) \times 5.310 \text{ GJ} / \text{m}^3 = 157.7 \text{ GJ}/100 \text{ m}^2 = 1.58 \text{ GJ/m}^2$
4. Embodied energy of 36 m^2 (30% exterior wall area) timber frame windows in 100 m^2 building = $18.36 \text{ GJ}/100 \text{ m}^2 = 0.18 \text{ GJ/m}^2$
5. Embodied energy of brick (new technology) wall 0.35m wide and 3m high in 100 m^2 building including windows = $0.18 \text{ GJ/m}^2 + 1.58 \text{ GJ/m}^2 = 1.78 \text{ GJ/m}^2 \sim 1.8 \text{ GJ/m}^2$

In Table 5.26, the embodied energy of roofs in OCRT brick (new technology) construction is assumed equal with the embodied energy of light construction roofs (0.4 GJ/m^2) in Table 5.25. Likewise, in this type of OCRT construction, the embodied energy for floors and foundations are assumed equal with the embodied energy for heavy construction floors and foundations (0.74 GJ/m^2 and 0.08 GJ/m^2 respectively), as in Table 5.25.

a. 6. Local Stone

In Table 5.26, the embodied energy of a local stone wall is calculated through the following steps:

1. Embodied energy of local stone = $1,890 \text{ MJ/ m}^3 = 1.89 \text{ GJ/ m}^3$ (reference: Mithraratne et al, 2007: 218)
2. The volume of a stone wall 0.4 m wide and 3m high in 100 m^2 building, assuming the windows occupy 30% (36 m^2 of 120 m^2) of the exterior walls = $31.7 \text{ m}^3/100 \text{ m}^2 = 0.31 \text{ m}^3/\text{m}^2$
3. Embodied energy of a local stone wall 0.4 m wide and 3 m high in 100 m^2 building excluding the windows as described above = $31.7 \text{ m}^3 (\text{stone}) \times 1.89 \text{ GJ/ m}^3 = 59.9 \text{ GJ}/100 \text{ m}^2 = 0.59 \text{ GJ}/\text{m}^2$
4. Embodied energy of 36 m^2 (30% exterior wall area) timber frame windows = $18.36 \text{ GJ}/100 \text{ m}^2 = 0.18 \text{ GJ}/\text{m}^2$
5. Total embodied energy of local stone wall 0.4m wide and 3m high in 100 m^2 building including windows = $0.18 \text{ GJ}/\text{m}^2 + 0.18 \text{ GJ}/\text{m}^2 = 0.36 \text{ GJ}/\text{m}^2$

In Table 5.26, the embodied energy of roofs in OCRT local stone construction is assumed equal with the embodied energy of light construction roofs ($0.4 \text{ GJ}/\text{m}^2$) in Table 5.25. Moreover, in this type of OCRT construction, the embodied energy for floors and foundations are assumed equal with the embodied energy for heavy construction floors and foundations ($0.74 \text{ GJ}/\text{m}^2$ and $0.08 \text{ GJ}/\text{m}^2$ respectively) in Table 5.25.

a.7 . Imported Stone

In Table 5.26, the embodied energy of an imported stone wall is calculated in exactly the same way as for a local stone wall above, but using the following embodied energy coefficient.

Embodied energy of stone (imported) = $17,610 \text{ MJ}/\text{m}^3 = 17.61 \text{ GJ/ m}^3$ (reference: Mithraratne et al, 2007: 218)

The embodied energy of an imported stone wall 0.4m wide and 3m high in 100 m^2 building with windows thus = $0.18 \text{ GJ}/\text{m}^2 + 5.58 \text{ GJ}/\text{m}^2 = 5.75 \text{ GJ}/\text{m}^2$

In Table 5.26, the embodied energy of roofs in OCRT imported stone construction is assumed equal with the embodied energy of light construction roofs ($0.4 \text{ GJ}/\text{m}^2$) in Ta-

ble 5.25. In addition, in this type of OCRT construction, the embodied energy for floors and foundations are assumed equal with the embodied energy for heavy construction floor and foundation (0.74 GJ/m^2 and 0.08 GJ/m^2) in Table 5.25.

a. 8. Concrete

In Table 5.26, embodied energy of concrete wall with aluminium framed windows is calculated through the following steps:

1. Embodied energy of concrete (ready mix 30 MPa) = $2,762 \text{ MJ/m}^3 = 2.8 \text{ GJ/m}^3$ (reference: Mithraratne et al, 2007: 218)
2. Volume of a concrete wall 0.2 m wide and 3m high in 100 m^2 building excluding windows that occupy 30% (36 m^2 of 120 m^2) of the exterior walls = $16.3 \text{ m}^3/100\text{m}^2 = 0.16 \text{ m}^3/\text{m}^2$
3. Embodied energy of a concrete wall 0.2 m wide and 3 m high in 100 m^2 building excluding windows = 16.3 m^3 (concrete) $\times 2.8 \text{ GJ/m}^3 = 45.6 \text{ GJ}/100\text{m}^2 = 0.46 \text{ GJ/m}^2$
4. Embodied energy of aluminium framed window ($1.2 \text{ m}^2 \times 1.2 \text{ m}^2$) = $5,978 \text{ MJ} \sim 6 \text{ GJ}$ (reference: Wolf, 2011:5)
5. Embodied energy of 1m^2 aluminium framed window = $4,151 \text{ MJ/m}^2 = 4.15 \text{ GJ/m}^2$
6. Embodied energy of 36 m^2 (30% exterior walls area) aluminium framed window in 100 m^2 (building area) = $147.6 \text{ GJ}/100 \text{ m}^2 = 1.47 \text{ GJ/m}^2$
7. Embodied energy of a concrete wall 0.2 m wide and 3 m high in 100 m^2 building including windows, therefore = $1.47 \text{ GJ/m}^2 + 0.46 \text{ GJ/m}^2 = 1.93 \text{ GJ/m}^2$

In Table 5.26, the embodied energy of roofs in OCRT concrete construction is assumed equal with the embodied energy of light construction roofs (0.4 GJ/m^2) in Table 5.25. Furthermore, in this type of OCRT construction, the embodied energy for floors and foundations are assumed equal with the embodied energy for heavy construction floor and foundation (0.74 GJ/m^2 and 0.08 GJ/m^2) in Table 5.25.

a. 9. OCRT Accommodation Services: Embodied Energy Summary

Using the results from Table 5.26, the integrated embodied energy of wall, roof, floor and foundations used in each type of OCRT accommodation is presented in Table 5.27 and Figure 5.30.a. As revealed, imported stone construction has the largest embodied energy of 6.97 GJ/m^2 and a timber structure has the lowest embodied energy at 1.1

GJ/m². The embodied energy of other types of OCRT constructions are in the range of 1.4–5.12 MJ/m².

Type of building structure	Embodied energy use (GJ/m ²)
Timber	1.1
Timber and masonry	2.04
Mud brick (mixed with other materials)	1.4
Brick ¹ mixed with other materials (old technology)	5.12
Brick ¹ mixed with other materials (new technology)	3.02
Stone ² (local)	1.58
Stone ² (imported)	6.97
Concrete	3.15

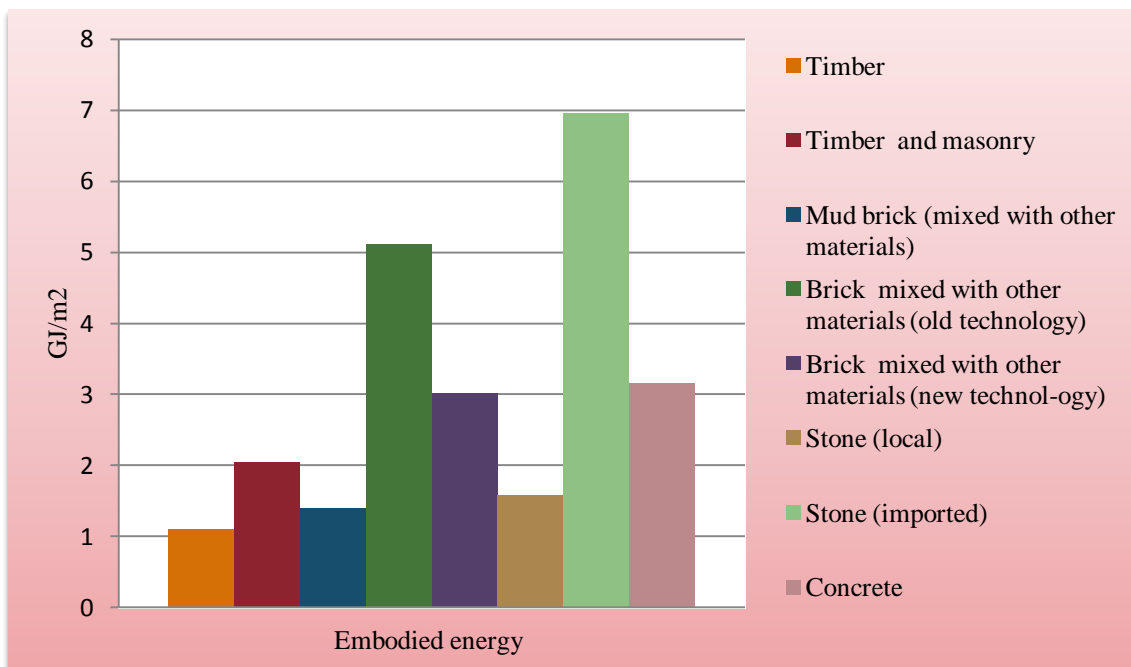


Figure 5.30.a: Embodied energy of OCRT- types of construction (2011)

b. OCRT Accommodation Services: Operating Energy

As shown in Figure 5.30 OCRT accommodation services (NB and RB) use conventional sources of energy and facilities so that operational energy for heating and lighting in both NB and RB types should be similar. Based on this assumption, this thesis uses the operating energy for each type of New Zealand accommodation service proposed by Becken et al (2001:376) (Table 5.28). As indicated in Table 5.28, in New Zealand, the hotel category has the largest operational energy at 155 MJ/visitor night followed by B&B (110 MJ/visitor night), Backpacker (39 MJ/visitor night), motel (32 MJ/visitor night) and camping grounds (25 MJ/visitor night).

Table 5.28: Mean energy intensities for various accommodation categories

Category	Energy use (MJ/m ² /year)	Energy use per visitor night (MJ/visitor)
Hotel	571	155
B&B	300	110
Motel	250	32
Backpacker	617	39
Camping ground	N/A	25

• Reference: Becken et al, 2001: 376

c. OCRT Accommodation Services: Life Cycle Energy Use and EF

The life cycle energy use of each type of OCRT accommodation is calculated as the sum of the embodied and operational energy over an assumed life of the building, here taken as 50 years. In Tables 5.29-5.35 the embodied energy use of each type of construction is calculated through the following equation:

Embodied energy (GJ/year) of each type of construction = Total area (m²) of the type of construction (see Table 5.23) × Embodied energy over a 50 year life cycle (GJ/m²) ÷ 50

In this equation ‘total area (m²) of the type of construction’ is calculated as follows:

Total area (m²) of the type of construction = Capacity of the type of construction (see Table 5.14) × average area/bed of the type of accommodation service (see Table 5.20)

In Tables 5.28-5.34 the operational energy use (GJ/year) of each type of construction is equivalent to the area occupied × operational energy use (GJ/m²) of the type of construction

In the above equation the area occupied of each type of construction is equivalent to the percentage occupancy rate of the type of accommodation × total area (m²) of the type of construction. Note, this is not the same as the overall occupied area shown in Table 5.23, which is the total space occupied in a year.

In Tables 5.29- 5.35:

1. Life cycle energy use (GJ/year) of each type of construction = Operational energy (GJ/year) + embodied energy (GJ/year)
2. EF (gha/year) of each type of construction = life cycle energy (GJ/ year) ÷ 100 (GJ/ha) (global average carrying capacity)

3. The total EF of each type of OCRT accommodation services is equivalent to the sum of its types of construction EFs (Tables 5.29-5.35).

c.1 . SC Accommodation Service: Life Cycle Energy Use and EF

As shown in Table 5.29, SC timber construction with an area of 11,466m² accounts for the largest embodied energy value of 252.2 GJ/year followed by 1622.5m² timber and masonry (66.2 GJ/year). Other SC types of construction including mud brick mixed with other materials (973.5 m²), brick mixed with other materials (177m²) and local stone (590m²) use embodied energy in the range of 18.1- 27.3 GJ/year (Table 5.29).

In Table 5.29, SC operational energy is assumed to be 0.3 GJ/m²/year, equal to B&B operational energy use (see Table 5.28). As determined in Table 5.29, SC timber construction accounts for the largest total operational energy 450.6 GJ/year and other types of SC construction operational energy use are in the range of 6.9- 63.7 GJ/year.

In addition, the 11,466 m² of SC timber construction as expected account for the largest total life cycle energy of 702.8 GJ/year and other types of construction have life cycle energy between 25-129.9 GJ/year. Influenced by its life cycle energy use, as shown in Table 5.29, SC timber construction has the biggest EF (7.03gha), much larger than other SC construction types which have EFs between 0.42-1.29 gha. Also from Table 5.29, timber construction with the lowest embodied energy over a 50 year life cycle (1.1GJ/m²) can be considered the dominant type of SC construction. Table 5.29 shows that the total EF of OCRT SC accommodation services is 9.65 gha.

Table 5.29: OCRT- Life cycle energy use of SC accommodation services (2011)

Material	Embodied energy Over a 50-year life cycle (GJ/m ²)	Total Area (m ²)	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year) ¹	Occupied area (m ²) ¹	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	11,466	252.2	0.3	1,502	450.6	702.8	7.03
Timber and masonry	2.04	1622.5	66.2	0.3	212.5	63.7	129.9	1.29
Mud brick (mixed with other materials)	1.4	973.5	27.3	0.3	127.5	38.2	65.5	0.66
Brick mixed with other materials (old technology)	5.12	177	18.1	0.3	23	6.9	25	0.25
Stone (local)	1.58	590	18.6	0.3	77	23.1	41.7	0.42
Concrete	-	-	-	-	-	-	-	-
Total			382.4			582.5	964.9	9.65

1. See Table 5.24

- Occupancy rate of OCRT SC = 13.1% (see Table 5.17)
- Area per bed space = 29.5m² (see Table 5.18)

c. 2. B&B Accommodation Services

Table 5.30 shows B&B timber construction with the lowest embodied energy over a 50 year life cycle (1.1GJ/m²) accounts for the majority area of 9,000 m² followed by timber and masonry (6,760 m²) and brick mixed with other materials (2,000 m²). Other types of construction including mud brick (mixed with other materials), local stone and concrete account for areas between 1,040-1,480m².

Table 5.30 demonstrates that B&B timber and masonry construction with an area of 6,760 m² accounts for the largest single embodied energy value of 275GJ/year, followed by brick mixed with other materials (2,000 m² area, 204.7GJ/year) and timber (9,000 m² area, 198GJ/year). Other types of B&B construction including mud brick (mixed with other materials), concrete and local stone with areas between 1,040-1,480 m² have total embodied energies in the range of 29.12-85.7 GJ/year.

When it comes to operational energy, calculated as before based on occupancy, as shown in Table 5.30 the largest occupied area of 1,251m² in OCRT B&B accommodation is timber construction, followed by 940m² timber and masonry, and 278 m² brick (mixed with other materials). The occupied areas of other types of B&B construction including mud brick (mixed with other materials), concrete and local stone are in the range of 144.6-206 m². Table 5.30 indicates that B&B timber construction accounts for

the largest operating energy use of 375.3 GJ/year and 573.3 GJ/year life cycle energy (based on a 50 year life) followed by timber and masonry (282 and 557.8 GJ/year) and brick mixed with other materials (83.4 and 288.2 GJ/year). Other types of B&B construction have operational and life cycle energy between (43.7 and 72.5 GJ/year) – (61.8 and 108.6 GJ/year).

Comparing the EF of B&B construction types, timber has the largest EF (5.73gha) followed by timber and masonry (5.6gha) and brick mixed with other materials (2.9gha) (Table 5.30). The annual EF of other types of B&B construction including mud brick (mixed with other materials), concrete and local stone are between 0.73 and 1.4 gha. The total life cycle energy and EF of OCRT B&B accommodation services are 1,743 GJ/year and 17 gha /year (Table 5.30).

Table 5.30: OCRT- Life cycle energy use of B&B accommodation services (2011)

Material	Embodied energy over a 50 year life cycle (GJ/m ²)	Total Area (m ²) ³	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year) ¹	Occupied area (m ²) ²	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	9,000	198	0.3	1,251	375.3	573.3	5.73
Timber and masonry	2.04	6,760	275.8	0.3	940	282	557.8	5.6
Mud brick (mixed with other materials)	1.4	1040	29.12	0.3	144.6	43.4	72.5	0.73
Brick mixed with other materials (old technology)	5.12	2000	204.8	0.3	278	83.4	288.2	2.9
Stone (local)	1.58	1480	46.8	0.3	206	61.8	108.6	1.1
Concrete	3.15	1360	85.7	0.3	189	56.7	142.4	1.4
Total			840.2			859.2	1,743	17

1. See Table 5.24
 2. Occupancy rate of OCRT B&B = 13.9% (see Table 5.17)
 3. Area per bed space = 40m² (see Table 5.18)

c. 3. BP Accommodation Services: Life Cycle Energy Use and EF

As shown in Table 5.31 Bp timber and timber mixed with masonry construction equally account for the largest floor area of 1,296 m² (648 m² each) followed by brick mixed with other materials (216 m²). Other type of constructions including mud brick (mixed with other materials) and local stone occupy smaller areas of 48 and 72 m² respectively (Table 5.31).

Table 5.31 indicates that the 648 m² of Bp timber and masonry construction have the largest embodied energy of 26.4GJ/year, followed by brick mixed with other materials (22.1GJ/year) and timber (14.3GJ/year). Other types of B&B constructions including mud brick (mixed with other materials) and local stone account for 2GJ/year and 1.5GJ/year respectively (Table 5.31).

As shown in Table 5.31, in comparison with other types of Bp construction, timber and timber mixed with masonry have the largest occupied area of 182 m² (91m² each). Other types are smaller with brick mixed with other materials (30 m²), mud brick mixed with other materials (10m²) and local stone (7 m²). Likewise, Bp timber and timber mixed with masonry constructions account for the largest value of operating energy at 111 GJ/year (each uses 55.5 GJ/year). Other types of Bp construction including mud brick (mixed with other materials), brick (mixed with other materials) and local stone have operational energy values of between 4.27 and 18.3 GJ/year (Table 5.31).

In comparison with other types of Bp construction, the timber and masonry type has the largest life cycle energy of 81.6 GJ/year, followed by timber (69.8 GJ/year), brick mixed with other materials (40.4 GJ/year), mud brick mixed with other materials (8.1 GJ/year) and local stone (5.77 GJ/year) (Table 5.31).

Comparing the EFs of Bp constructions, timber and masonry has the largest EF (0.8 gha) followed by timber (0.7 gha) and brick mixed with other materials (0.4 gha), mud brick mixed with other materials (0.008 gha) and local stone (0.06gha). The total life cycle energy and EF of OCRT Bp accommodation services are 205 GJ/year and 2.05 gha /year respectively (Table 5.31).

Table 5.31: OCRT- life cycle energy use of Bp accommodation services (2011)

Material	Embodied energy Over a 50-year life cycle (GJ/m ²)	Total Area (m ²)	Embodied energy (GJ/year)	Operation energy (GJ/ m ² /year)	Occupied area (m ²)	Operating energy (GJ/year)	Life-cycle energy use (GJ/ year)	EF gha/year
Timber	1.1	648	14.3	0.61	91	55.5	69.8	0.7
Timber and masonry	2.04	648	26.4	0.61	91	55.5	81.6	0.8
Mud brick (mixed with other materials)	1.4	72	2	0.61	10	6.1	8.1	0.08
Brick ¹ mixed with other materials (old technology)	5.12	216	22.1	0.61	30	18.3	40.4	0.4
Stone (local)	1.58	48	1.5	0.61	7	4.27	5.77	0.06
Concrete	3.15	-	-	0.61	-	-	-	-
Total			66.3			139.67	205	2.05

1. Occupancy rate of OCRT-Bp = 14% (see Table 5.17)
2. Area per bed space = 12m² (see Table 5.18)

c. 4. OCRT Motels: Life Cycle Energy Use and EF

As shown in Table 5.32 timber construction forms the largest single area of motels at 6,033 m² followed by timber and masonry (2,755 m²), and concrete (1,335 m²). Other types of construction are brick (mixed with other materials) and local stone and these occupy areas of 744 and 372 m² (Table 5.32).

Table 5.32 indicates that motel timber construction accounts for the largest embodied energy value of 132.7 GJ/year (6,033 m² × 1.1 GJ/ m²/ 50 years/ 50), followed by timber and masonry (2,755 m² × 2.04 GJ/ m²/50 years/ 50 = 112 GJ/year), concrete (1,335 m² × 3.15 GJ/50 years/50 = 84.1 GJ/year), brick mixed with other materials (744 m² × 5.12 GJ /m²/50 years/50 = 76.2 GJ/year) and local stone (372 m² × 1.58 GJ/m²/50 years/ 50 = 11.8 GJ/year).

As shown in Table 5.32, in comparison with other types of motel construction, timber comprises the majority of occupied area at 1,273 m² followed by timber and masonry (581 m²), concrete (282 m²), brick mixed with other materials (157 m²), and local stone (78 m²).

In Table 5.32 the operating energy for different constructions is calculated through following equation:

$$\text{Operating energy (GJ/year)} = \text{Occupied area (m}^2\text{)} \times \text{Operation energy (m}^2\text{/year)}$$

Table 5.32 indicates that motel timber constructions account for the largest value of operating energy at 318GJ/year and life cycle energy at 450.9GJ/year, followed by timber mixed with masonry (145.2GJ/year and 257.6 GJ/year). Operational and life cycle energies of other types of construction including concrete, brick mixed with other materials and local stone are in a range of (19.5GJ/year and 31.3GJ/year) to (70.5GJ/year and 154.6GJ/year) (Table 5.32).

In terms of EF for motels, timber motels account for the largest annual EF (4.5 gha) followed by timber and masonry (2.6 gha) (Table 5.32). The annual EF of brick mixed with other materials, concrete and local stone are in the range of 0.31-1.5 gha. The total EF of OCRT motel accommodation services is 10.1 gha (Table 5.32).

Material	Embodied energy Over a 50-year life cycle (GJ/m ²)	Total Area (m ²)	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year)	Occupied area (m ²) ¹	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	6,033	132.7	0.25	1,273	318.2	450.9	4.5
Timber and masonry	2.04	2,755	112.4	0.25	581	145.2	257.6	2.6
Mud brick (mixed with other materials)	-	-	-	-	-	-	-	-
Brick ¹ mixed with other materials (old technology)	5.12	744	76.2	0.25	157	39.2	115.4	1.2
Stone ² (local)	1.58	372	11.8	0.25	78	19.5	31.3	0.31
Concrete	3.15	1,335	84.1	0.25	282	70.5	154.6	1.5
Total			417.2			592.6		10.1

1. Occupancy rate of OCRT-Motel = 21.1% (see Table 5.17)
 2. Area per bed space = 16.9 m² (see Table 5.18)

c. 5. OCRT Homestead: Life Cycle Energy Use and EFAs shown in Table 5.33

homestead accommodation in local stone construction contains the largest area of 470 m² followed by timber and mud brick (mixed with other materials) each with 179 m².

Table 5.33 shows that homestead stone construction accounts for the largest embodied energy value of 14.9 GJ/year. Mud brick and timber have lower embodied energy values of 4.9 GJ/year and 3.9 GJ/year (Table 5.33).

As shown in Table 5.33, homesteads of stone contain the largest occupied area of 470 m². They also account for the largest operational energy (3.5 GJ/year) and life cycle energy (18.4GJ/year). Timber is lower at 1.25 GJ/year and 5.12 GJ/year, almost the same as mud brick at 1.25 GJ/year and 6.15GJ/year (Table 5.33). This means for the homestead category, stone construction accounts for the largest annual EF (0.18 gha) followed by mud brick (mixed with other materials) (0.06 gha) and timber (0.05gha) (Table 5.33).

Table 5.33: OCRT- Life cycle energy use of homestead accommodation services (2011)

Material	Embodied energy Over a 50-year life cycle (GJ/m ²)	Total Area(m ²) ²	Embodied energy (GJ/year)	Operation energy (GJ/ m ² /year) ³	Occupied area(m ²) ¹	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	176	3.9	0.25	5	1.25	5.12	0.05
Timber and masonry	-	-	-	-	-	-	-	-
Mud brick (mixed with other materials)	1.4	176	4.9	0.25	5	1.25	6.15	0.06
Brick mixed with other materials (old technology)	-	-	-	-	-	-	-	-
Stone (local)	1.58	470	14.9	0.25	14	3.5	18.4	0.18
Concrete	-	-	-	-	-	-	-	-
Total			23.7			6		0.3

1. Occupancy rate of OCRT-homestead = 3% (see Table 5.17)

2. Area per bed space = 29.4 m² (see Table 5.18)

3. Operation energy (GJ/ m²/year) of homestead accommodation is assumed to be the same as operation energy of motel.

c. 6.OCRT Hotels: Life Cycle Energy Use and EF

As shown in Table 5.34, timber and masonry hotel construction accounts for the largest area in this category of 5,442 m² area followed by local stone (2,299 m²), timber (1,862 m²), and brick mixed with other materials and mud brick (mixed with other materials) with equal areas of 233 m² (Table 5.34). In addition, the timber and masonry type accounts for the largest embodied energy value of 222GJ/year, followed by stone (72.6 GJ/year) (Table 5.34). The types of mud brick (mixed with other materials) and brick

(mixed with other construction) have embodied energy of 6.5 and 23.9 GJ/year (Table 5.34).

As determined in Table 5.34, hotel timber and masonry construction contains the biggest occupied area (593 m²) and has the largest annual operating energy of 338 GJ/year). Other types of hotel construction including timber, mud brick, brick and stone contain occupied areas between 25-251m² and have operational energy use in the range 14-143 GJ/year (Table 5.34).

Moreover, the same hotel category of timber and masonry construction accounts for the largest life cycle energy of 560 GJ/year and has the biggest EF (5.6 gha) (Table 5.34). The life cycle energy uses of other types of construction are between 20.5-215.5 GJ/year and their EFs are in the range of 0.2-2.2 gha. (Table 5.34).The total life cycle energy use of OCRT hotels is 481.1 GJ/year and its total annual EF is 9.8 gha (Table 5.34).

Material	Embodied energy Over a 50-year life cycle (GJ/m ²)	Total Area(m ²) ²	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year) ³	Occupied area(m ²) ¹	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	1,862	41	0.57	188	107	148	1.48
Timber and masonry	2.04	5,442	222	0.57	593	338	560	5.6
Mud brick (mixed with other materials)	1.4	233	6.5	0.57	25	14	20.5	0.2
Brick mixed with other materials (old technology)	5.12	233	23.9	0.57	25	14	37.9	0.4
Stone (local)	1.58	2,299	72.6	0.57	251	143	215.5	2.2
Concrete	-	-	-	-	-	-	-	-
Total			366			616	981.9	9.8

1. Occupancy rate of OCRT-hotel = 10.9 % (see Table 5.17)
 2. Area per bed space = 29.1 m² (see Table 5.18)

c.7 . OCRT Camping Sites: Life Cycle Energy Use and EF

As determined in Table 5.35 the embodied energy of camping sites is not available and this study considers the operational energy use of this type of accommodation to be equal to its life cycle energy use. Table 5.35 indicates that the total annual EF of 2,048

OCRT- powered sites with 6,248 visitor nights and 0.025 GJ/visitor night operational energy use is equivalent to 1.6 gha.

Table 5.35: OCRT- life cycle energy use of camping (powered sites) accommodation services (2011)

Material	Embodied energy Over a 50-year life cycle (GJ/m ²)	Total visitor nights	Embodied energy (GJ/year)	Operation energy (GJ/visitor night) ¹	Operating energy (GJ/year)	Life-cycle energy use (GJ/ year)	EF gha/year
Assumed negligible	N/A	6,248	N/A	0.025	156.2	156.2	1.6
Total							

1. Occupancy rate of OCRT-camp ground = 24 % (see Table 5.17)
 2. Area per bed space = 6 m²
 3. Total powered camping bed spaces = 2,048

d. The Total EF of OCRT Accommodation Services (First Scenario)

The total EF of 788 OCRT accommodation services (based on the assumption that all are NB) is 50.5gha/year in 2011 (Table 5.36). As shown in Table 5.36, OCRT motels comprise the majority of 22.6% of visitor nights followed by camping (powered sites) (18.6%), Bps (15%), B&Bs (14.9%), SCs (14%), hotels (11.7%) and homestead (3.2%). Likewise, as demonstrated in Table 5.36, in comparison with other types of OCRT accommodation services, motels have the biggest EF (10.1 gha) and homestead accommodation has the smallest EF (0.3gha). Other types of OCRT accommodation services have an annual EF in a range of 1.6-9.8 gha.

Table 5.36: OCRT- EF of accommodation services (2011)

Types of accommodation	Visitor nights	%	EF (gha/year)	%
SC	5,559	14	9.65	19.1
B&B	5,899	14.9	17	33.7
Bp	5,941	15	2.05	4
Motel	8,954	22.6	10.1	20
Homestead	1,273	3.2	0.3	0.6
Hotel	4,626	11.7	9.8	19.4
Camping (powered sites)	7,373	18.6	1.6	3.2
Total	39,625	100	50.5	100

Figure 5.27 demonstrates that OCRT B&B accommodation services have the biggest annual EF/visitor night (0.003gha/visitor night) and homesteads and powered camp sites have the smallest annual EF/visitor night (0.0002gha). Other OCRT accommodation services have annual EF/visitor night in a range of 0.0003- 0.002gha (Figure 5.31).

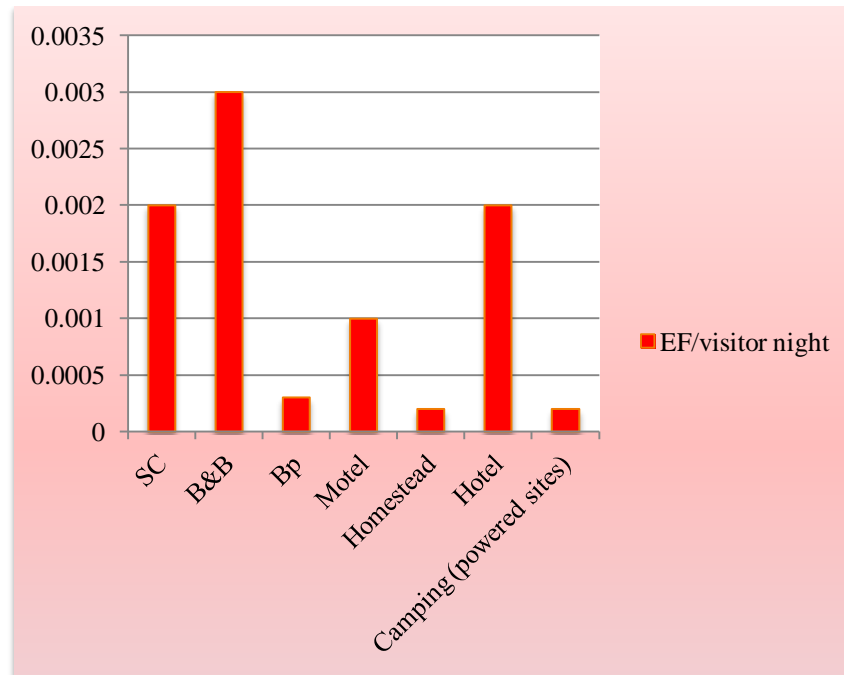


Figure 5.31: The annual EF/visitor night of OCRT- accommodation services

5.6.8.2. The EF of OCRT Accommodation Services (Second Scenario: Reducing Embodied Energy through the use of Refurbished Buildings)

Throughout the second scenario the embodied energies of RB buildings are subtracted from the whole life cycle energy use of OCRT accommodation services. Consequently, the life cycle energy use of OCRT accommodation services in the second scenario includes the embodied energy of NB buildings plus the total operating energy of both RB and NB buildings. As RB accommodation services use similar energy resources and facilities as those used in NB buildings, their operation energy use is assumed to be the same as that of NB accommodation, and is included in the whole life cycle energy use of OCRT accommodation services (Table 5.37).

Table 5.37 demonstrates that in the second scenario the total life cycle energy of OCRT accommodation services is equal to 4,318.2 GJ/year. Moreover, the EF of OCRT accommodation services is equivalent to $4,318.2 \text{ GJ/year} \div 100 \text{ (GJ/ha)} = 43.2 \text{ gha/year}$ (Table 5.37).

Table 5.37: OCRT- accommodation services- life cycle energy of new and refurbished buildings (second scenario)

Type	Total embodied energy (GJ/year)	NB (%)	RB (%)	Embodied energy of NB (GJ/year)	Total operating energy (GJ/year)	Life-cycle energy (GJ/year)	EF (gha/year)
SC	382.4	68.8	31.2	263	582.5	846	8.5
B&B	840.2	70.6	29.4	593.2	859.2	1452.4	14.5
Bp	66.3	61	39	40.4	139.67	180.1	1.8
Motel	417.2	96.7	3.3	403.4	592.6	996	10
Homestead	23.7	21.4	78.6	5.1	6	11.1	0.11
Hotel	366	13.9	86.1	50.9	616	667	6.7
Camping	N/A	100	0.00	N/A	156.2	156.2	1.6
Total	2,095.8	-	-	1,356	2,952.17	4,318.2	43.2

Table 5.38 compares the EF of OCRT accommodation services from the two scenarios. As shown in Table 5.38, the influence of using RB buildings as accommodation means the annual EF of OCRT accommodation is decreased by 14.5% (7.3 gha) from 50.5 gha to 43.2gha. The main reason for the reduced EF of OCRT accommodation services in the second scenario is the reduction in embodied energy from the use of RB buildings over the whole life cycle energy of accommodation services. This is based on the assumption that they are more than 50 years old, as the embodied energy of NB buildings is calculated over a 50 year assumed life.

Table 5.38: Reduced EF of OCRT accommodation services influenced by the use of RB as tourism accommodation

EF1 (all buildings are assumed to be new buildings)	Present EF
50.5 gha/year	43.2gha/year
<ul style="list-style-type: none"> Reduced EF of OCRT influenced by the use of RB (12.9% of total bed spaces) as a part of accommodation services = 7.3 gha/year= 14.5 % of EF1 	

5.6.8.3. EF of OCRT Accommodation Services (Third Scenario Including RB, NB Buildings and All Types of Outdoor Sitting Area)

This section attempts to determine the influence of using open air spaces including verandas and balconies (V/B) on the EF of OCRT accommodation buildings. In the second scenario, calculation of the EF of OCRT accommodation services has been conducted based on the assumption that all NB and RB spaces are indoor spaces. In this section, OCRT accommodation services are assumed to contain both indoor and outdoor spaces and their EFs also comprise the EFs of both types of space. The difference between the results of the second and third scenario for measurement of EF indicates the influence of using open air areas on the EF of OCRT accommodation services.

This thesis explores the number of V/B and outdoor sitting areas by their types (shared and private) through using OCRT accommodation websites in which related documents,

pictures and videos are published (see Appendix 5). Table 5.39 contains summarised information about the numbers and types of V/Bs and outdoor sitting areas by type of accommodation, as explained in Appendix 5.

Table 5.39 shows that 106 bed spaces have access to 13 shared V/Bs and 49 bed spaces use 14 private V/Bs. As shown in Table 5.39 the largest access comes from the 44 SC bed spaces that use 8 shared V/Bs followed by 43 hotel bed spaces and 19 B&B bed spaces that use 3 and 2 shared V/Bs respectively. Table 5.39 also shows most private access occurs in 19 B&B bed spaces that can use 4 private V/Bs (there is more than one bed space per room), followed by 16 SC bed spaces and 14 motel bed spaces that use 8 and 2 private V/Bs respectively.

Also as shown in Table 5.39, 462 OCRT bed spaces have access to 44 shared outdoor sitting areas and 29 bed spaces (more than one bed space per room) can use 6 private outdoor sitting areas. The largest shared access is in the motel category with 184 motel bed spaces with access to 6 shared outdoor sitting spaces, followed by 139 B&B bed spaces (17), 95 SC bed spaces (16), and 44 hotel bed spaces (3) (Table 5.39). Furthermore, of 243 OCRT-bed spaces that use 73 private outdoor sitting areas, the majority occur in the 109 B&B bed spaces that use 52 private outdoor sitting areas (Table 5.39). The other types of accommodation bed spaces have lower overall access to private facilities, with 28 SC bed spaces accessing 10 such sitting areas. Other categories have limited access to such facilities (Table 3.39).

Type	V ¹ /B ²				Outdoor sitting			
	S ³	NV ⁴	P ⁵	NV	S	No ⁶	P	No
SC	44	8	16	8	95	16	28	10
B&B	19	2	19	4	139	17	109	52
Bp	0	0	0	0	0	0	0	0
Motel	0	0	14	2	184	6	71	4
Homestead	0	0	0	0	0	0	6	1 ⁷
Hotel	43	3	0	0	44	3	29	6
Total	106	13	49	14	462	42	243	73

1: Veranda
2: Balcony
3: Number of bed spaces sharing area
4: Number of veranda/ balcony
5: Number of bed spaces using private area
6: Number of outdoor sitting spaces.
7: Outdoor sitting with timber pergola roof taken as veranda

This thesis calculates the areas of 12 selected V/Bs (6 NB and 6 RB) found in OCRT accommodation services to measure the average area (m²) of all V/Bs used in OCRT accommodation services (Appendix19). This calculation is conducted through using the roof plans, and scaled views and elevations (Appendix19), published in websites and from satellite maps. The calculation of the areas is conducted by using Map tool 2 and a scaled ruler.

As shown in Appendix19, in OCRT accommodation services, the average area per V/B is 14.3 m². Table 5.40 includes the areas of the number of V/Bs used in each type of OCRT accommodation service. As shown in Table 5.40, of 27 V/Bs with a total area of 387 m², the majority are used in SC accommodation services (16 V/Bs with an area of 229 m²), followed by 6 in B&B (86m²), 3 in hotels (43m²) and 2 in motels (29 m²).

Table 5.40: OCRT- outdoor sitting used as part of accommodation services (summary)

Type	V/B	
	No. ¹	Area (m ²) ²
SC	16	229
B&B	6	86
Bp	0	0
Motel	2	29
Homestead	0	0
Hotel	3	43
Total	27	387
1. Number of V/B		
2. Average area (m ²) per veranda/balcony = 14.3		

Table 5.41 sets out the initial embodied energy of a V/B element based on its floor and roof. Since the embodied energy of V/B foundation has already been calculated and included in embodied energy of indoor spaces, it is ignored in Table 5.41. As the embodied energy of partition walls between a veranda/balcony and indoor spaces has already been calculated and included in embodied energy of indoor spaces, it is not calculated in Table 5.41. As result, in Table 5.41, the total embodied energy for a V/B over a 50 year life is 620 MJ/m² or 0.62 GJ/m². Consequently the annual embodied energy intensity for a V/B is equivalent to $0.62 \text{ GJ/m}^2 \div 50 = 0.012 \text{ GJ/m}^2/\text{year}$.

Table 5.41: OCRT- accommodation services-initial embodied energy intensities for Veranda/Balcony

Building element	Embodied energy intensity over a 50 year life (MJ/m ²)	
	Light construction ³	
Foundation ¹	-	-
Floor	220	35.5%
Walls ²	-	-
Roof	400	64.5%
Total	620	100%

1. Embodied energy of foundation has already been calculated and added to embodied energy of indoor spaces.
2. Embodied energy of partition walls between veranda/balcony and indoor spaces has already been calculated and included embodied energy of indoor spaces.
3. Reference: Mithraratne et al, 2007:159

Table 5.42 shows that the embodied energy of 387 m² OCRT accommodation service V/Bs is 4.6 GJ/year. Since V/Bs are open areas and do not use energy in operation (in particular for heating), their operating energy is assumed to be zero. Thus as shown in Table 5.42, the life cycle energy use of 387 m² is equal to its embodied energy (4.6 GJ/year) and its annual EF is 0.046 gha.

Table 5.42: OCRT-accommodation services, life cycle energy and EF of outdoor sitting space (veranda/balcony)

Type	Embodied energy (GJ/m ² per year)	Area (m ²)	Embodied energy (GJ/year)	Operating energy	Life-cycle energy (GJ/year)	EF (gha/year)
Veranda/balcony	0.012	387	4.6	0	4.6	0.046

In Table 5.43 the total area of OCRT accommodation services is separated into the two areas of 79,978 m² indoor spaces and 378 m² V/B. The annual EF of OCRT accommodation services (indoor spaces) as shown in Table 5.43 is 0.00053gha/m² (43.1gha ÷ 80,356m²). Thus the annual EF of 79,978 m² indoor spaces is equivalent to 79,978m² × 0.00053 gha/m² = 42.3 gha (Table 5.43). Likewise the annual EF of V/Bs with the area of 378 m² area is equivalent to 0.046gha (see Tables 5.42 and 43). As a result the total annual EF of 80,356 m² OCRT accommodation services comprising 79,978 m² indoor spaces and 378 m² V/B is equivalent to the sum of 0.046 gha and 42.3 gha = 42.4 gha (Table 5.43).

As shown in Tables.5.37 and 5.38, the results from the second scenario in which all OCRT accommodation services are assumed to be indoor spaces give a total annual EF of 43.2 gha. In addition, in the third scenario, in which outdoor spaces are considered, the annual EF reduces to 42.4gha. This is a small 1.9% reduction in annual EF. Alternatively, thinking of the EF as a land area, 0.8 gha (8000m²) ÷ 387 m² = 20.7 m², so 1m² V/B reduces the EF of OCRT accommodation services by 20.7m².

Table 5.43: Reduced EF of OCRT-accommodation serviced influenced by the use of veranda/balcony

Indoor spaces			Outdoor sitting (veranda/balcony)		
Area (m ²) ¹	EF (gha/m ²)	EF (gha)	Area (m ²)	EF (gha/m ²)	EF (gha)
79,978	0.00053	42.3	387	0.00012	0.046

1. Total area of OCRT accommodation services (m²) = 80,356 (see Table 5.19)

- Total EF of OCRT accommodation services (second scenario) gha= 43.2 (see Table 5.34)
- Total EF of OCERT accommodation services (indoor space + Veranda/ balcony) gha = 42.4
- Reduction in OCRT- EF influenced by the use of 387 m² veranda and balcony (0.48% of 80,356m²) = 0.8 gha

5.7. OCRT Visitor Activities

This section investigates the environmental impacts of OCRT visitor activities (as part of their social-cultural behaviours) through calculation of their annual EF. This study explores the frequency of activities offered by OCRT accommodation services to visitors through using the official websites of the OCRT community and 201 websites of 783 OCRT accommodation services. The offered activities are explained in Appendix 5 and they are classified into indoor and outdoor activities in Appendix 7.

In addition the frequency of the offered activities shown in Appendix 7 and summarised in Tables 5.44 and 5.45 can be considered as an indicator of the attitude of OCRT participants and members (in this case accommodation owners) to the types of sustainable tourism activities. Comparison between the EFs of the conducted activities and their frequency also can indicate a social-ecological perspective of the attitude of tourism participants to being sustainable.

5.7.1. Indoor Activities (Frequency)

Table 5.44 sets out OCRT indoor activities offered by accommodation services to visitors. These activities are classified into seven types: curling at Naseby, indoor sports (except curling at Naseby), indoor water sports, education, art activities, cultural/spiritual activities, and games (Table 5.44). According to CODC, 2011:18, the curling at Naseby is considered as the only indoor curling sport and attracts about 36.6% (see Table 5.48) of OCRT visitors in 2011, while curling at Alexandra is included in other activities. Since this study attempts to evaluate the environmental, cultural and economic footprint of curling at Naseby on OCRT (at regional scale) and on Naseby (at urban scale) its frequency is separated from curling at Alexandra in Table 5.44. This makes an opportunity to explore the relationship between frequency of curling at Naseby and its environmental, cultural and economic impacts.

Indoor sports	F ¹	Indoor sports (except curling at Naseby)	F ¹	Indoor water sports	F ¹	Education	F ¹	Art	F ¹	Cultural/spiritual activities	F ¹	Games	F ¹
Curling at Naseby	46	Curling at Alexandra	2	Swimming pool	7	Reading materials	46	Music	1	Catholic Church	1	Games	4
-	-	Bowling	2	Aquatic centre	1	Maps and local information	1	-	-	Cafe Culture	2	-	-
-	-	Gun club	1	-	-	Photography workshop	2	-	-	-	-	-	-
Total	46		5		8		49		1		3		4

1. F: Frequency

Table 5.45 presents a summary of OCRT indoor activities and their frequency (F) cited in Table 5.44. As determined in Table 5.45 and Figure 5.32, of the total 116 (100%) indoor activities offered to OCRT visitors, education has the majority share of 49 (42.2%) followed by curling at Naseby at 46 (39.7%). The frequency of other indoor activities including indoor sport (except curling at Naseby), indoor water sports, art, cultural/spiritual activities and games occur in the F range of 1(0.9%)-8(6.9%).

Activities	F	%
Indoor sports (curling at Naseby)	46	39.7
Indoor sports (except curling at Naseby)	5	4.3
Indoor water sports	8	6.9
Education	49	42.2
Art	1	0.9
Cultural/spiritual activities	3	2.6
Games	4	3.4
Total	116	100

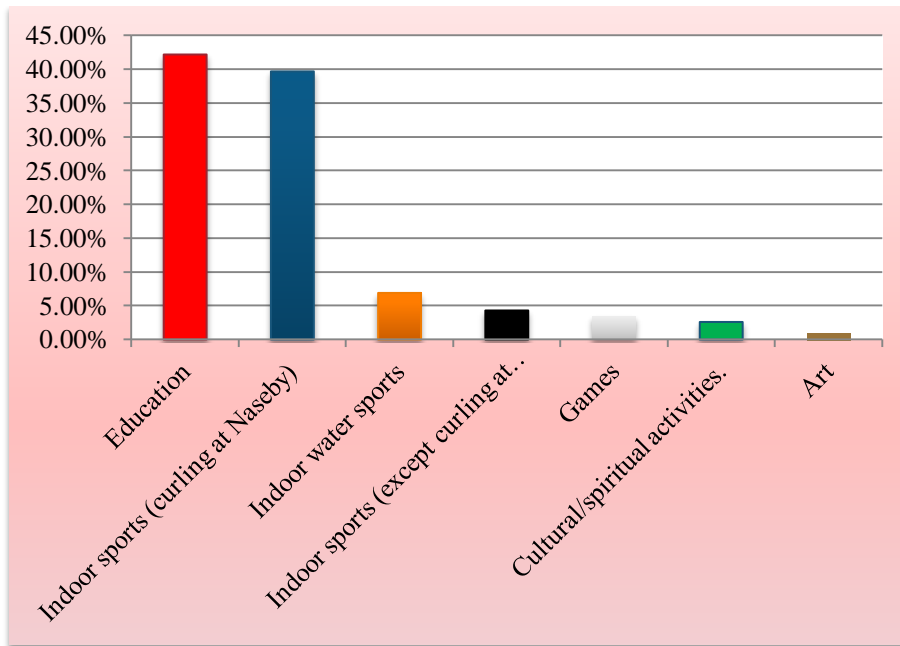


Figure 5.32: OCRT- frequency of indoor activities offered by accommodation services to visitors

5.7.2. OCRT Outdoor Activities (Frequency)

This study explores 47 types of outdoor activity offered by OCRT accommodation services to visitors in 2011 as shown in Appendix 7, and based on access to information about outdoor activities through using 201 OCRT accommodation websites. The 47 offered outdoor activities are explained by their related accommodation service in Appendix 7. This Thesis classifies the 47 types of OCRT outdoor activities into seven types: sports (at a playground), motorised sports and activities, water sports, winter sports, cycling, sports on horseback, recreational activities, art activities, farm activities, walking and climbing (See Appendix 20 and its summary, Table 5.46).

Table 5.46 shows that of total 492 OCRT outdoor activities, water sports form the largest category at 122 occurrences, followed by sports at a playground (86), winter sports (54), walking (52), and cycling (42). The frequencies of other OCRT outdoor activities offered are between 1 and 38 (Table 5.46).

Table 5.46: OCRT- Frequency of the outdoor activities offered by accommodation services to visitors.

Outdoor activity	F	%
Sports (at a playground)	86	17.5
Motorised sports and activities	31	6.3
Water sports	122	24.8
Winter sports	54	11
Cycling	42	8.5
Sports on horseback	12	2.4
Recreational activities	38	7.7
Art activities	32	6.5
Farm activities	22	4.5
Walking	52	10.6
Climbing	1	0.2
Total	492	100

Figure 5.33 illustrates the types of OCRT outdoor activities by their percentage frequencies as cited in Table 5.46 (right column).

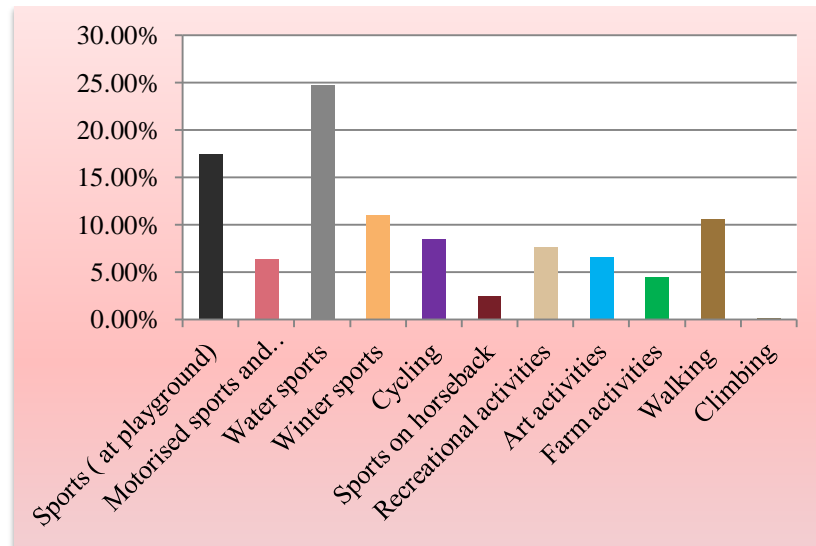


Figure 5.33: Percentage frequencies of OCRT outdoor activities offered by accommodation services to visitors (2011)

Total Frequency of OCRT outdoor activities = 492 (see Table 5.43)

5.7.3. OCRT Other Visitor Opportunities by Accommodation Service

Apart from the indoor and outdoor activities discussed above, other suggestions as to things visitors can do are offered by ORTC accommodation services. Appendix 21 contains summarised information about these and their frequency of occurrence. Here, these opportunities for tourist visits are categorised into five groups: cities and villages of note, historic sites and buildings, industrial archaeology sites, scenery, garden/farm/park, and museum/art gallery (Appendix 21). Table 5.47 offers summarised information related to OCRT visiting opportunities offered as cited in Appendix 21.

Table 5.47 and Figure 5.34 determine that in comparison with other subjects, visits to scenery are suggested most frequently with 132 occurrences (24.1% of a total of 548), followed by historic sites and buildings (118-21.5%) and garden/farm/park (100-18.3%). The frequency of other subjects to visit including cities and villages, industrial archaeological sites, and museum/art gallery are in the range of 40 (7.3%) – 97(17.7%), see Table 5.47 and Figure 5.34.

Subjects	F	%
Cities and villages	97	17.7
Historic sites and buildings	118	21.5
Industrial archaeological sites	61	11.1
Scenery	132	24.1
Garden/ farm/park	100	18.3
Museum/art gallery	40	7.3
Total	548	100

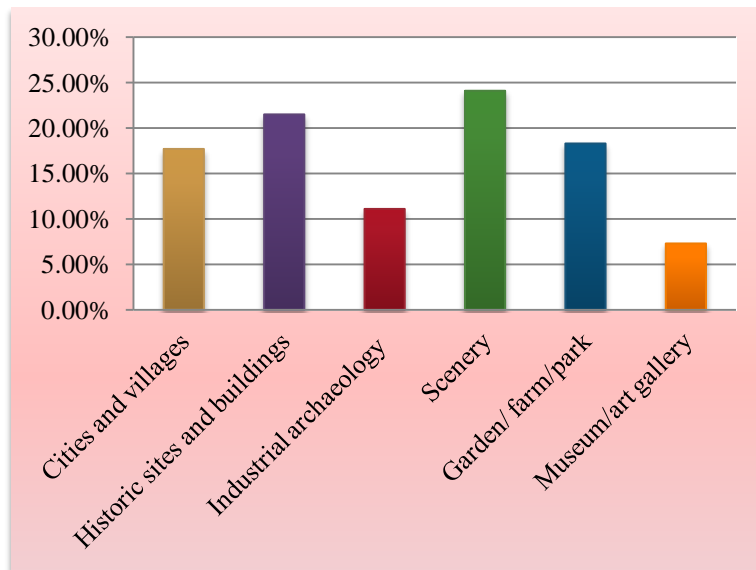


Figure 5.34: Frequency of the subjects to visit offered by OCRT accommodation services to visitors (2011)

5.7.4. OCRT Activities by Numbers of Visitors

This Thesis uses the CODC research (2011) as a base to calculate the number of OCRT visitors per activity in 2011. According to CODC (2011:18) in 2011, 160 OCRT visitors nominated a total of 354 activities that they did or were going to undertake while in Central Otago. These nominated activities are aggregated in Table 5.48, and show that of the 160 OCRT visitors the most visited site was the Taieri Gorge Railway 74 visitors (46.3%), followed by curling 59 visitors (36.9%), visits to gold mining towns 56 visitors

(35%), sightseeing tours 49 visitors (30.6%) and visits to old Cromwell town 36 visitors (22.5%). Other activities as shown in Table 5.48 fell in the range of 1 visitor (0.6%) -27 visitors (16.9%).

Table 5.48: OCRT activities conducted by visitors 2011 (n=160)

Activities	Count	% of visitors
Taieri Gorge Railway	74	46.3
Curling	59	36.9
Gold mining towns	56	35
Sightseeing tours	49	30.6
Old Cromwell town	36	22.5
Wineries	27	16.9
Visiting friends and relatives	24	15
Hayes engineering	13	8.1
Mountain biking Naseby	4	2.5
fishing	3	1.9
Golf	2	1.3
Swim at Ophir and Alexandra	1	0.6
Clyde dam Tour	1	0.6
Golden Progress mine	1	0.6
Walking	1	0.6
Ophir- high country farm	1	0.6
Biking	1	0.6
Fruit picking along trail	1	0.6
Other	354	-

• Reference: CODC, 2011:18

This chapter calculates the number of OCRT visitors per activity through using the percentage proportional split of the 160 visitors (cited in Table 5.48) and applying it to the total 11,788 OCRT visitors in 2011 (Table 5.49). This calculated split for the number of visitors is then used as the basis to calculate the EF of each OCRT tourism activity.

Table 5.49: OCRT activities conducted by 11,788¹visitors -2011

Activities	% of visitors ²	Number of Visitors
Taieri Gorge Railway	46.3	5,458
Curling	36.9	4,350
Gold mining towns	35	4,126
Sightseeing tours	30.6	3,607
Old Cromwell town	22.5	2,652
Wineries	16.9	1,992
Visiting friends and relatives	15	1,768
Hayes engineering	8.1	955
Mountain biking Naseby	2.5	295
fishing	1.9	224
Golf	1.3	153
Swim at Ophir and Alexandra	0.6	71
Clyde dam Tour	0.6	71
Golden Progress mine	0.6	71
Walking	0.6	71
Ophir- high country farm	0.6	71
Biking	0.6	71
Fruit picking along trail	0.6	71

1. See Figure 5.2.
2. % split of 11,788 visitor assumed same as for 160 visitors cited in Table 5.45.
• Reference: CODC, 2011:18

5.7.5. OCRT: EF of Visitor Activities

5.7.5.1. EF of Indoor Activities (Curling at Naseby)

a. Embodied Energy

Table 5.50 shows that the total area of the Naseby Indoor Curling Centre is 1,300 m². To calculate the embodied energy of the Naseby Indoor Curling Centre, its structure is assumed to involve materials similar to the super insulated construction (see Table 5.25) set out in Mithraratne et al (2007:159). Table 5.50 determines that the embodied energy intensity of the Naseby Indoor Curling Centre is 1,248,000 MJ over a 50 year life, which is equivalent to (1,248,000/50) 40,040 MJ/year (40GJ/year).

Table 5.50: Naseby Indoor Curling Centre, embodied energy

Total area (m ²)	Super insulated construction			
	Building element	Embodied energy intensity over 50 years (MJ/m ²) ¹	Embodied energy intensity over 50 years (MJ)	Embodied energy intensity (MJ/year)
1,300	Foundation	30	39,000	780
	Floor	370	481,000	9,620
	Walls	580	754,000	15,080
	Roof	560	728,000	14,560
	Total	-	1,248,000	40,040

1. Reference: Mithraratne et al, 2007:159

b. Operational Energy Use

Due to the shortage of information about the operating energy of Naseby Curling Club, this thesis assumes its annual operational energy use is similar to the “Oliver Curling Club, British Colombia” (Renewable Energy magazine (RE)-2000) and uses this to calculate the total life cycle energy use of Naseby Curling Club.

b. 1. Oliver Curling Club

According to RE (2000:2) the Oliver Curling Club is a two-storey, wood frame building constructed in 1974. As pointed out by RE (2000:2) the Club includes approximately 167m² of floor space, in addition to the 836 m² four-sheet ice surface and its walls are insulated to R12 ft²°Fh/Btu (approximately 2.1 m²°C/W) and the ceiling to R 20 ft²°Fh/Btu (approximately 3.5 m²°C/W), which are about the same as required in the New Zealand Building Code. The Oliver Curling Club (RE, 2000:2) has an ammonia refrigeration system to make ice, and electric heaters warm the viewing area and locker rooms, second floor lounge and the ice area.

b. 2. Oliver Curling Club: Operating Energy

As shown in Table 5.51 the average energy consumption of the Oliver Curling Club is 41,800 kWh/ year, which is equivalent to 150,480 MJ/year. Since the total area of the Oliver Curling Club is 1,170m², its annual average energy consumption = (150,480 MJ ÷ 1,170 m²) = 128.6 MJ/m² or 0.35 MJ/m² per day (Table 5.51).

Table 5.51: Oliver Curling Club- Operating energy use per square metre per year

Area (m ²) ¹	Average energy consumption (kWh in 4 years) ²	Average energy consumption (kWh/year)	Average energy consumption (MJ /year)	Average energy consumption (MJ/m ² /year)	Average energy consumption (MJ/m ² /day)
1,170	167,200	41,800	150,480	128.6	0.35

1. Area of Oliver Curling Club= 1,170 m² including 834 m² four-sheet ice surface + 334m² two storey building.
2. Reference: Renewable Energy (RE) magazine, 2000: 4.

b. 3. Naseby Curling Club: Operating Energy

As shown in Table 5.52 the area of Naseby Curling Club (1300 m²) includes the 980 m² four-sheet ice surface and a 320 m² two storey building. Thus the average energy consumption of Naseby Curling Club is 167,180 MJ/Year (1,300 m² × 128.6 MJ/m²/year) (Table 5.52).

Table 5.52: Naseby Curling Club- Operating energy use per square metre per year

Area (m ²) ¹⁻²	Average energy consumption (MJ/year)	Average energy consumption (MJ/m ² /year)	Average energy consumption (MJ/m ² /day)
1,300	167,180	128.6 ³	0.35

1. Area of Naseby Curling Club (1300 m²) includes 980 m² four-sheet ice surface and 320 m² two storied building.
2. Area of Naseby Curling Club has been calculated by using the elevation of building and Z Map Tools, and Oliver Curling Club average energy consumption (See Table 5.51).

c. EF of Naseby Curling Centre

The life cycle energy of Naseby Curling centre, which is the sum of its total embodied energy (see Table 5.50) and operating energy (see Table 5.52) is equivalent to (40.04 GJ/year + 167 GJ/year) = 207.2 GJ/year (Table 5.53). The annual EF (gha) of Naseby Curling Centre as shown in Table 5.53 is 207.2 GJ/year (life cycle energy use)/100 (global average carrying capacity) = 2.07 gha.

Table 5.53: Total ecological footprint¹ of Naseby Curling Centre

Area (m ²)	Embodied energy (GJ/year)	Average energy consumption (GJ/year)	Life-cycle energy (GJ/year)	EF (gha)
1,300	40.04	167.2	207.2	2.07

1. In this table the EF of Naseby Curling Centre is calculated based on life-cycle energy use irrespective of visitor numbers.

d. EF of Naseby Curling Centre per Visitor

As demonstrated in Table 5.54, in 2008, 13,000 New Zealand visitors (including 4,350 OCRT visitors- see Table 5.56) used the Naseby Indoor Curling Centre. The average time that visitors book the sheet ice is 1.5 hours. As a result, the average energy consumption of Naseby Curling Centre per visitor can be calculated through the following equation:

Average energy consumption MJ/visitor/year = 13,000 (visitors) ÷ 167,180 MJ/year (average energy consumption of Naseby Curling Centre) = 11.6 MJ/visitor/year (Table 5.54).

Table 5.54: Naseby Curling Club – annual operating energy use per visitor

Area (m ²)	Average energy consumption (MJ /year)	Visitors per year (2008) ¹	Average energy consumption (MJ/visitor/ year)
1,300	167,180	13,000	11.6

1.Reference: www.curling.co.nz

As shown in Table 5.55, the Naseby Curling Centre is open seven hours a day throughout the year. Its total working time per year is thus (7 hours/day × 365 days) 2,555 hours (Table 5.55). In Naseby indoor curling there are four sheets of ice and at any time a maximum of 32 people can curl in the indoor rink. (www.curling.co.nz) and minimum time to book a sheet is one hour (www.curling.co.nz) (Table 5.55).

Naseby Curling Centre working time (hours per day) ¹	7
Numbers of ice sheets	4
Maximum number of people who can curl in one time	32
Naseby Curling Centre working time (hours per year)	2,555
Maximum number of player (1 hour per player) per year	91,380
Max time that each visitor (13,000) can play curling (hours/per year)	5
Min time that a visitor can book to play indoor curling ¹	1
average time that a visitor could play indoor curling (hours/visitor)	3
1. Reference: www.curling.co.nz	

As shown in Table 5.56, in 2011, 4,350 OCRT visitors who play curling at Naseby cover 33.5% of its whole visitors (13,000 visitors). Thus the annual EF of the 4,350 OCRT visitors is equal to 33.5% of the EF of 13,000 visitors (2.07gha-see Table 5.53) = 0.7 gha (Table 5.56), consequently the annual EF of an OCRT visitor playing curling is equivalent to $0.7 \text{ (gha)} \div 4,350 \text{ visitors} = 0.00016 \text{ gha}$. The annual EF of the Naseby Curling Centre is 0.00016 gha /visitor.

Total number of OCRT visitors	% of OCRT visitors who play indoor curling at Naseby Curling Centre ¹	Total number of OCRT- visitors who play curling at Naseby curling centre ¹	EF of 13,000 visitors of Curling centre (gha)	EF of 4,350 OCRT visitors (33.5 % of 13,000 Naseby indoor curling centre visitors) gha ²
11,788	36.9%	4,350	2.07 ³	0.7 (33.5 % of 2.07)
1. See Table 5.48				
2. EF of Naseby Curling Centre (indoor curling) per visitor / year = (0.7 gha ÷ 4,350 visitors) 0.00016 (gha)				
3. See Table 5.53				

5.7.5.2. EF of OCRT Outdoor Activities

a. OCRT: the EF of Walking

As indicated in Table 5.57, the total energy of walking is in a range 0.37-2.21 MJ/km. Table 5.57 shows that of 11,788 OCRT visitors 0.6% (71) walk.

Table 5.57. Range of energy values relating to different aspects of travel, and range of total values (MJ/km)

Mode	Embodied energy	Food/fuel	shower	Total
Walking	0.25	0.12-1.96	No shower	0.37-2.21
Cycling	0.03-0.08	0.06-1.42	No shower	0.09-1.50
Cycling(shower	0.03-0.08	0.06-1.42	0.57-2.52	0.60-4.02
Driving (average)	0.50	3.19	No shower	3.69*

* The value for average driving is included as a comparison
 • Reference: Vale and Vale, 2009:109

Since the distance that a person can walk (easy walking) in an hour is equal to 5 km (Browning et al, 2005:390), the total distance that 71 OCRT visitors can walk in an hour is 355km.(Table 5.58). As a result, the distance that 71 OCRT visitors can walk in a typical assumed walk of 3 hours duration is 1,065km (355×3) (Table 5.58).

Since the EF of food consumed by OCRT visitors has already been calculated in food category, the minimum value of 0.37 MJ/km (see Table 5.57) is used to calculate the EF of OCRT visitors- walking.

As shown in Table 5.58, the energy use (MJ) of 71 OCRT visitors who walk for 3 hours (1,065km) is equivalent to 394.05 MJ (0.394 GJ) and their EF is equivalent to 0.394 GJ (energy use) ÷ 100 (global average carrying capacity) = 0.0039 gha. In addition, the EF of an OCRT visitor who walks 3 hours is 0.00005 gha /visitor (Table 5.58).

Table 5.58: Ecological footprint of OCRT- visitors (walking)

Total number of OCRT visitors	11,788
% of visitors who walk (see Table 5.45)	0.6
Total number of OCRT visitors who walk (see Table 5.49)	71
Distance that a person can walk (easy walking) (km/hour)	5 ¹
Distance that 71 OCRT visitors can walk an hour (km)	355
Distance that 71 OCRT visitors can walk in 3 hours (km)	1, 065
Energy use of walking (MJ/km) (see Table 5.57)	0.37 ²
Energy use (MJ) of 71 OCRT visitors who walk 3 hours (1,065km)	394.05 ³
EF of 71 OCRT visitors who walk 3 hours (gha)	0.0039
EF (gha) of an OCRT visitor who walks 3 hours	0.00005

1. Reference: (Browning et al, 2005:390)
 2. See Table 5.57
 3. 394.05 (MJ)= 0.394 (GJ)

b. EF of Golf

As demonstrated in Table 5.59, golf is classified into two types; the walking golfer and the driving golfer. The integration of each golfer's share of the land and the embodied energy of equipment used in each type of golf determines its total impact (MJ/participant/year). As shown in Table 5.59, the total impact of a walking golfer and

driving golfer who play 38 rounds per year (Vale and Vale, 2009: 269) are 2,393 and 5,621 MJ/participant/year respectively. Since the average of OCRT visitor nights is 3.6 (see Figure 5.7), this study makes this assumption that each OCRT visitor who on average stays in OCRT 3.6 nights, plays 3 rounds of golf per 3.6 nights.

As shown in Table 5.59 the average impacts of each player who play 38 rounds is 4007(MJ/participants/38 rounds/year). Consequently the average impact of golfing per visitor per round is equal to $4007 \text{ (MJ/participants/38 rounds/ year)} \div 38 \text{ (rounds)} = 105 \text{ MJ/participants/round/year}$. As a result, the average impact of each OCRT visitor who plays 3 rounds of golf is equal to $105 \text{ (MJ/participants/rounds/year)} \times 3 = 315 \text{ MJ/participant} = 0.315 \text{ GJ/ participant}$

Table 5.59: Total impact per player of land and equipment associated with Golf

Type	Land area	Energy equivalent of land (MJ/38 rounds/year)	Embodied energy of equipment (MJ/ year)	Total impact(MJ/ participant/38 rounds/year) ¹⁻²
Golf (walking golfer)	170	2,295	98	2,393
Golf (driving golfer)	170	2,295	3,326	5,621

1. Average impact of both Golf (walking and driving) = 4007 MJ/participant/38 rounds/year
 2. Average impact of both Golf (walking and driving) = 105 MJ/participant/ round/year
 3. Average impact of both Golf (walking and driving) = 315 MJ/participant/3 rounds/year
 • Reference: Vale and Vale, 2009:276

Table 5.60 determines that of 11,788 OCRT visitors only 1.3% (153) play golf (Table 5.40). Table 5.60 shows that the total impact of the 153 OCRT visitors who play 3 rounds of golf is equivalent to $153 \times 315 \text{ MJ/participant/year}$ (See Table 5.59) = 48,195 MJ/ participant/year. As a result the annual EF of these 153 visitors is equivalent to $48.195 \text{ GJ/year}/100 = 0.48 \text{ gha}$. In addition, the EF of an OCRT visitor who plays golf is equivalent to the total EF of 153 visitors (0.48gha) \div total number of OCRT visitors who play golf (153) = 0.003 gha/participant/year.

Table 5.60: EF of OCRT visitors – golf (2011)

Total Numbers of OCRT visitors	% of OCRT visitors who play golf	Numbers of OCRT visitors who play golf.	Total impact (MJ/ participant/3 rounds/year) ¹	Total impact of OCRT visitors who play golf (MJ/year)	EF (gha) ²
11,788	1.3	153	315	48,195	0.48

1. Average impact of Golf (walking and driving) = 315 MJ/participant/ 3 rounds/ year (See Table 5.59)
 2. The EF of an OCRT visitor who plays golf (gha/participant) = $0.48(\text{gha}) \div 153 \text{ (visitor)} = 0.003 \text{ (gha/visitor)}$

c. EF of Other Activities (except curling, walking and golf)

Becken (2001) proposes a method for the classification of tourism attractions and activities as shown in Table 5.61. According to Becken (2001:2) these can be put into the three categories of attraction, entertainment, and activity (Table 5.61). These three main categories comprise related sub-categories as shown in Table 5.61.

Table 5.61: Classification of tourism attractions and activities.

Generic category	Sub-category	Types of operation/ establishments
Attractions	Building	Art gallery, Historic building, Museum, Visitor centre.
	Park	Aquarium, Botanical garden, Wildlife park, Zoo.
	Amusement	Experience centre, Gondola, Sporting complex, Theme park.
	Industry	Brewery, Farm show, Wine trail and tasting.
	Natural attraction	Geothermal attractions (hot pools), Glow worm caves.
	Performance, Other	Cinema, live theatre or concert, Maori culture performance, bar/night club, casino, shopping.
Activity	Air activity	Scenic flight, Air sports (skydiving, ballooning, parapenting), Whale watching by air, Heliskiing.
	Sea activity	Diving, Dolphins/Whale watching, Jet boating, Sailing, Scenic boat cruise, Sea/coastal fishing.
	Adventure activity	Adventure (bungy and others), Kayaking, Mountain biking, Mountain, rock climbing/caving, Rafting, Skiing, Surfing.
	Nature recreation	Cycling, Golf, Horse riding, Lake/river fishing, Tramping, Viewing wildlife in natural setting, Walking (guided), sightseeing.

• Reference: Becken, 2001:2

Table 5.62 contains the average, minimum and maximum energy use suggested by Becken (2001:3) for each of the three categories of tourism activities and attractions. As shown in Table 5.62, the total annual energy use of the three categories varies considerably from a minimum energy use of 9GJ to the maximum of 77,020GJ (Table 5.62).

Table 5.62: Energy use per annum for the three categories.

Energy use	Attraction	Entertainment	Activity
Average (GJ)	411	1,599	495
Min (GJ)	4	36	9
Max (GJ)	53,223	77,020	29,208

• Reference: Becken, 2001:3

The energy use per visitor for the three categories of attraction, entertainment and activity are also calculated by Becken (2001) and presented in Table 5.63. Although the minimum energy use/visitor is relatively constant across the three categories, the maximums vary considerably, with activities being clearly the most energy consuming.

Table 5.63: Energy use per tourist for the three categories.

	Attraction	Entertainment	Activity
Average (MJ/ tourist)	6.2	9.4	95.6
Min (MJ/ tourist)	0.6	0.8	0.6
Max (MJ/ tourist)	174.0	38.5	2902.8

• Reference: Becken, 2001:3

Becken (2001:5) also sets out the energy use per visitor of key operator types as shown in Table 5.64. In this analysis, the maximum energy is used by diving (800MJ/tourist) and the minimum by a farm show. Operator types that involve transport have the higher values in Table 5.64.

Table 5.64: Energy use per tourist of key operator types.

Operator type	Energy (MJ/tourist)
Farm show	7
Museum	10
Zoo/wildlife park	16
Experience centre	29
Rafting	36
Guided walks (including transport to sites)	110
Scenic boat cruise	165
Scenic flight	340
Diving	800

• Reference: Becken, 2001:5

This thesis uses the categorisation of tourism activities and attractions proposed by Becken (2001) as discussed above to classify OCRT tourism activities in the following table.

Table 5.65: Classification of OCRT tourism attractions and activities.

Generic category	Sub-category	Types of operation/establishment	Average MJ/tourist
Attractions	Building	Hayes engineering, Gold mining towns, Old Cromwell town, Taieri, Golden progress mine	6.2
	Park	-	-
	Amusement	-	-
	Industry	Wineries, Ophir high country farm, fruit picking along trail	6.2
	Natural attraction	-	-
Entertainment	Performance, Other	-	-
Activity	Air activity	-	-
	Sea activity	-	-
	Adventure activity	Mountain biking at Naseby	95.6
	Nature recreation	Fishing, swim at Ophir, Sightseeing, Clyde dam tour, biking.	95.6

• Reference: Becken, 2001:2

Likewise, the average energy use of each type of operation/establishment as calculated by Becken (2001:3) (Table 5.63) is considered here to represent the energy use of OCRT types of operation/establishment (Table 5.65).

c. 1. EF of Biking (excluding mountain biking, Table 5.49)

As shown in Table 5.66, in 2011, 71 visitors (0.6 % of 11,788 OCRT visitors) engaged in biking (mountain biking is a separate category, see Table 5.49). The total impact of a participant who bikes is 95.6 MJ/year (see Table 5.65) thus the total impact of 71 OCRT visitors is $71 \times 95.6 \text{ MJ/visitor/year} = 6,788 \text{ MJ/year} = 6.8 \text{ GJ/year}$ (Table 5.66). As a result, the EF of 71 OCRT visitors who bike is $6.8 \text{ GJ/year} \div 100$ (average global carrying capacity) = 0.068 gha/year (Table 5.66). Moreover the EF of an OCRT visitor who bikes is $0.068 \div 71 = 0.0009 \text{ gha/visitor/year}$.

Table 5.66: EF of OCRT visitors – biking (2011)

Total Numbers of OCRT visitors	% of OCRT visitors who play biking	Numbers of OCRT visitors who play biking.	Total impact (MJ/ participant) ¹	Total impact of 71 OCRT visitors who play biking (MJ)	EF (gha) ³
11,788	0.6	71	95.6	6,788 ²	0.068

1. (See Table 5.65)
 2. 6,788 MJ/year = 6.8 GJ/ year
 3. EF (gha/ visitor/ year) of an OCRT visitor – biking = 0.0009

c. 2. The EF of OCRT Visitors: Mountain Biking at Naseby

Table 5.67 shows 295 (2.5% of 11,788 OCRT) visitors go mountain biking at Naseby (see Table 5.49). The total impact of a participant who does this is 95.6 MJ/year (see Table 5.65). Consequently the total impact of 295 OCRT visitors is 295×95.6 MJ/visitor/year = 28,202 MJ/year = 28.2 GJ/year (Table 5.67). As a result, the EF of 295 OCRT visitors who go mountain biking is 28.2 GJ/year \div 100 (global average carrying capacity) = 0.28 gha (Table 5.67). In addition the EF of an OCRT visitor who goes mountain biking is $0.28 \div 295 = 0.0009$ gha/visitor/year (Table 5.67).

Total Numbers of OCRT visitors	% of OCRT visitors mountain biking	Numbers of OCRT visitors mountain biking	Total impact (MJ/ participant/year) ¹	Total impact of 295 OCRT visitors mountain biking (MJ/year)	EF (gha) ³
11,788	2.5	295	95.6	28,202 ²	0.28

1. Reference: Becken, 2001:2
 2. 28,202 MJ/year = 28.2 GJ/ year
 3. EF (gha/visitor/year) of OCRT visitor mountain biking = 0.0009

c. 3. EF of OCRT Visitors: Fishing

Table 5.68 indicates that 224 (1.9% of 11,788 OCRT visitors) go fishing (see Table 5.49). The total impact of a participant going fishing, assuming they need transport to get themselves and the gear to the fishing ground, is 95.6 MJ/year (see Table 5.65). In addition the total impact of 224 OCRT visitors going fishing is 224×95.6 MJ/visitor/year = 21,414 MJ/year = 21.4 GJ/year (Table 5.68). As a result, the EF of 224 OCRT visitors who go fishing is equivalent to 21.4 GJ/year \div 100 (global average carrying capacity) = 0.21 gha (Table 5.68). Moreover the EF of an OCRT visitor who goes fishing is $0.21 \div 224 = 0.0009$ gha /visitor/year (Table 5.68).

Total Numbers of OCRT visitors	% of OCRT visitors fishing	Numbers of OCRT visitors fishing	Total impact (MJ/ participant/year) ¹	Total impact of 224 OCRT visitors fishing (MJ/year)	EF (gha) ³
11,788	1.9	224	95.6	21,414	0.21

1. Reference: Becken, 2001:2
 2. 21,414 MJ/year = 21.4 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitors fishing = 0.0009

c. 4. The EF of OCRT Visitors: Swimming at Ophir

Table 5.69 shows that 71 (0.6 % of 11,788 OCRT) visitors swim at Ophir (see Table 5.49). Using the values in Table 5.65 and the same method as before, the EF per visitor for this activity is set out in Table 5.69.

Total Numbers of OCRT visitors	% of OCRT visitors swimming	Numbers of OCRT visitors swimming	Total impact (MJ/ participant/year) ¹	Total impact of 71 OCRT visitors swimming (MJ/year)	EF (gha) ³
11,788	0.6	71	95.6	6,788 ²	0.068

1. Reference: Becken, 2001:2
 2. 6,788 MJ/year = 6.8 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor swimming at Ophir = 0.0009

c. 5. The EF of OCRT Visitors: Wineries

Using the impact factor of 6.2 MJ/year (see Table 5.65) and the method above the EF of visitors to wineries is shown Table 5.70.

Total Numbers of OCRT visitors	% of OCRT visitors to wineries	Numbers of OCRT visitors to wineries	Total impact (MJ/ participant/year) ¹	Total impact of 1,992 OCRT visitors to wineries (MJ/year)	EF (gha) ³
11,788	16.9	1,992	6.2	12,350.4 ²	0.12

1. Reference: Becken, 2001:2
 2. 12,350.4 MJ/year = 12.3 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor to wineries = 0.00006

c. 6. The EF of OCRT Visitors: Sightseeing

Table 5.71 shows that 3,607 (30.6 % of 11,788 OCRT visitors) look at the scenery (see Table 5.49). Assuming that some form of transport is involved the total impact of a participant who visits scenery is 95.6 MJ/year (see Table 5.65). The impact per visitor is calculated as before and the results are shown in Table 5.71.

Total Numbers of OCRT visitors	% of OCRT visitors sightseeing	Numbers of OCRT visitors sightseeing	Total impact (MJ/ participant/year) ¹	Total impact of 3,607 OCRT visitors sightseeing (MJ/year)	EF (gha) ³
11,788	30.6	3,607	95.6	344,829.2	3.4

1. Reference: Becken, 2001:2
 2. 344,829.2 MJ/year = 344.8 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor sightseeing = 0.0009

c. 7. The EF of OCRT Visitors: visit to Hayes Engineering

The total impact of a participant who visits this heritage site is 6.2 MJ/year (see Table 5.65) on the assumption that unlike sightseeing, travel to the attraction is not using a lot of energy. The overall impact of this activity is calculated as before and set out in Table 5.72.

Table 5.72: EF of OCRT visitors – Hayes engineering (2011)					
Total Numbers of OCRT visitors	% of OCRT visitors to Hayes engineering	Numbers of OCRT visitors to Hayes engineering	Total impact (MJ/participant /year) ¹	Total impact of 955 OCRT visitors to Hayes engineering (MJ/year)	EF (gha) ³
11,788	8.1	955	6.2	5,921	0.06
1. Reference: Becken, 2001:2 2. 5,921 MJ/year = 5.9 GJ/ year 3. EF (gha/ visitor/ year) of OCRT visitor to Hayes engineering = 0.00006					

c. 8. The EF of OCRT Visitors: Ophir High Country Farm

Using the energy factor from Table 5.65 and the method established above, the impact of visitors to this activity is shown in Table 5.73.

Table 5.73: EF of OCRT visitors –Ophir high country farm (2011)					
Total Numbers of OCRT visitors	% of OCRT visitors to Ophir high country farm	Numbers of OCRT visitors to Ophir high country farm	Total impact (MJ/participant /year) ¹	Total impact of 71 OCRT visitors to Ophir high country farm (MJ/year)	EF (gha) ³
11,788	0.6	71	6.2	440.2	0.004
1. Reference: Becken, 2001:2 2. 440.2 MJ/year = 0.440 GJ/ year 3. EF (gha/ visitor/ year) of OCRT visitor to Ophir high country farm = 0.00006					

c. 9. The EF of OCRT Visitors; Taieri Gorge Railway

Based on the established method, the impact of visitors to this activity is shown in Table 5.74.

Table 5.74: EF of OCRT visitors – Taieri Gorge Railway (2011)					
Total Numbers of OCRT visitors	% of OCRT visitors to Taieri	Numbers of OCRT visitors to Taieri	Total impact (MJ/participant /year) ¹	Total impact of 5,458 OCRT visitors to Taieri (MJ/year)	EF (gha) ³
11,788	46.3	5,458	6.2	33,839.6	0.33
1. Reference: Becken, 2001:2 2. 33839.6 MJ/year = 33.8 GJ/ year 3. EF (gha/ visitor/ year) of OCRT visitor to Taieri = 0.00006					

c. 10. The EF of OCRT Visitors: Gold Mining Towns

Based on the established method, the impact of visitors to this activity is shown in Table 5.75.

Total Numbers of OCRT visitors	% of OCRT visitors to Gold mining towns	Numbers of OCRT visitors to Gold mining towns	Total impact (MJ/participant/year) ¹	Total impact of 4,126 OCRT visitors to Gold mining towns (MJ/year)	EF (gha) ³
11,788	35	4,126	6.2	25,581.2 ²	0.26

1. Reference: Becken, 2001:2
 2. 25,581.2 MJ/year = 25.6 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor to Gold mining towns = 0.00006

c. 11. The EF of OCRT Visitors: Old Cromwell Town

Based on the established method, the impact of visitors to this activity is shown in Table 5.76.

Total Numbers of OCRT visitors	% of OCRT visitors to Old Cromwell town	Numbers of OCRT visitors to Old Cromwell town	Total impact (MJ/participant/year) ¹	Total impact of 2,652 OCRT visitors to Old Cromwell town (MJ/year)	EF (gha) ³
11,788	22.5	2,652	6.2	16,442 ²	0.16

1. Reference: Becken, 2001:2
 2. 16,442 MJ/year = 16 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor to Old Cromwell town = 0.00006

c. 12. The EF of OCRT Visitors: Visiting Friends and Relatives

Since the energy use and the EF of visiting friends and relatives is not available, this study assumes them to be the same as the energy use and EF of homestead visitors. As a first attempt to calculate the EF of visiting friends and relatives, this study measures the energy use and EF of homestead visitors as shown in the following table

Table 5.77 shows that the total homestead visitor nights are 1, 273 (see Table 5.19) and the average OCRT accommodation services stay is equivalent 3.6 nights. Consequently, the total number of visitors who use OCRT homestead accommodation is $1,273 \div 3.6 = 354$ (Table 5.77). As shown in Table 5.37, the total EF of OCRT homestead accommodation is 0.11(gha). But it should be remembered that in Table 5.37 this EF does not consider the influence of using a veranda on the total EF of homestead accommodation services.

As indicated in Table 5.39, OCRT homestead accommodation services include 1 veranda (outdoor sitting area with a timber frame roof) with an (average) area of 14.3 m². Furthermore, as explained in Section 5.6.8.3 using 1m² V/B can reduce the EF of accommodation services by 20.7 m². Thus the total EF of OCRT homestead accommodation services including 14.3 m² V/B is equivalent to 1100 m² (0.11 gha) - (14.3 m × 18.1m²) = 803.99 m² = 0.08 gha (Table 5.77).

Total homestead visitor nights ¹	Average OCRT accommodation services visitor nights ²	Number of OCRT homestead visitors ³	Total EF of OCRT homesteads ⁴	EF of OCRT-homestead/visitor ⁵
1,273	3.6	354	0.08	0.0002

1. Reference: Table 5.17
 2. Reference: Figure 5.3.
 3. 1,273/3.6= 354
 4. Reference: Table 5.34
 5. 0.08 gha/354 visitors= 0.0002 gha/visitor

In 2011, 15% (1,768) of 11,788 OCRT visitors came to OCRT to visit their friends and relatives (Table 5.78). As discussed above, the EF of this type of visitor is assumed to be the same as the EF of visitors who stay in OCRT homestead accommodation services. Thus the EF (gha) of 1,768 people visiting friends and relatives = 1,768 × 0.0002 (gha/visitor) = 0.35 gha.

Total Numbers of OCRT visitors ¹	% of OCRT visitors visiting friends and relatives ²	Numbers of OCRT visitors visiting friends and relatives	EF / visitor (gha)	EF (gha)
11,788	15	1,768	0.0002 ³	0.35

1. See Figure 5.2
 2. See Table 5.45
 3. EF of OCRT visitors visiting friends and relatives is assumed to be the same as EF of OCRT-visitors who stay at homestead accommodation services (Table 5.77).

c. 13. The EF of OCRT Visitors: Clyde Dam Tour

Based on the method in Section c-12 and earlier, the impact of visitors taking the Clyde Dam Tour is set out in Table 5.79.

Table 5.79: EF of OCRT visitors – Clyde dam tour (2011)

Total Numbers of OCRT visitors	% of OCRT visitors on Clyde dam tour	Numbers of OCRT visitors on Clyde dam tour	Total impact (MJ/participant /year) ¹	Total impact of 71 OCRT visitors on Clyde dam tour (MJ/year)	EF (gha) ³
11,788	0.6	71	95.6	6,787.6	0.068

1. Reference: Becken, 2001:2
 2. 6,787.6 MJ/year = 6.8 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor on Clyde dam tour = 0.0009

c. 14. The EF of OCRT Visitors: Golden Progress Mine

Based on the method above, the impact of visitors taking the Golden Progress Mine Tour is set out in Table 5.80.

Table 5.80: EF of OCRT visitors – Golden Progress mine (2011)

Total Numbers of OCRT visitors	% of OCRT visitors to Golden Progress mine	Numbers of OCRT visitors to Golden Progress mine	Total impact (MJ/participant /year) ¹	Total impact of 71 OCRT visitors to Golden Progress mine (MJ /year)	EF (gha) ³
11,788	0.6	71	6.2	404.4	0.004

1. Reference: Becken, 2001:2
 2. 404.4 MJ/year = 0.4 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor to Golden progress mine = 0.00006

c. 15. The EF of OCRT Visitors: Fruit Picking Along Trail

Based on the method above, the impact of fruit picking visitors (the same as that of visitors to the Golden Progress mine) is set out in Table 5.81.

Table 5.81: EF of OCRT visitors – fruit picking along trail (2011)

Total Numbers of OCRT visitors	% of OCRT visitors fruit picking along trail	Numbers of OCRT visitors fruit picking along trail	Total impact (MJ/participant /year) ¹	Total impact of 71 OCRT visitors fruit picking along trail (MJ/year)	EF (gha) ³
11,788	0.6	71	6.2	404.4	0.004

1. Reference: Becken, 2001:2
 2. 404.4 MJ/year = 0.4 GJ/ year
 3. EF (gha/ visitor/ year) of OCRT visitor –fruit picking along trail = 0.00006

5.7.5.3. The Total EF of OCRT Visitor Activities

The total annual EF of OCRT visitor activities as shown in Table 5.82 is 6.57 gha. Table 5.82 and Figure 5.35 demonstrate that the three largest visitor activity EFs are those of sightseeing (3.4 gha), curling at Naseby (0.7 gha) and golf (0.48 gha). Moreover, as presented in Table 5.82 and Figure 5.35, fruit picking along the trail, visiting the Golden progress mine, and walking are the three types of OCRT visitor activities with the

smallest EFs (0.004 gha). Furthermore, the EFs of other OCRT visitor activities are in the range of 0.06-0.35 gha (Table 5.82 and Figure 5.35).

Type of activity	Activities	Numbers of visitor ¹	% of total 11,788 OCRT visitors	EF (gha/visitor) ³	EF (gha) ²	
Indoor activity	Curling	4,350	36.9	0.00016	0.7	
	Walking	71	0.6	0.00006	0.004	
	Golf	153	1.3	0.003	0.48	
Outdoor activities	Taieri	5,458	46.3	0.00006	0.33	
	Gold mining towns	4,126	35	0.00006	0.26	
	Sightseeing	3,607	30.6	0.0009	3.4	
	Old Cromwell town	2,652	22.5	0.0006	0.16	
	Wineries	1,992	16.9	0.00006	0.12	
	Visiting friends and relatives	1,768	15	0.0002	0.35	
	Hayes engineering	955	8.1	0.00006	0.06	
	Mountain biking at Naseby	295	2.5	0.0009	0.28	
	Fishing	224	1.9	0.0009	0.21	
	Swim at Ophir	71	0.6	0.0009	0.068	
	Clyde dam tour	71	0.6	0.0009	0.068	
	Golden progress mine	71	0.6	0.00006	0.004	
	Ophir high country farm	71	0.6	0.00006	0.004	
	Biking	71	0.6	0.0009	0.068	
	Fruit picking along trail	71	0.6	0.00006	0.004	
	Total		26,077	100	-	6.57

1. Number of visitor activities except golf, curling and walking = 21,503
 2. EF of visitor activities except golf, curling and walking = 5.4 (gha)
 3. EF/visitor of other visitor activities except golf, curling and walking = 0.00025gha

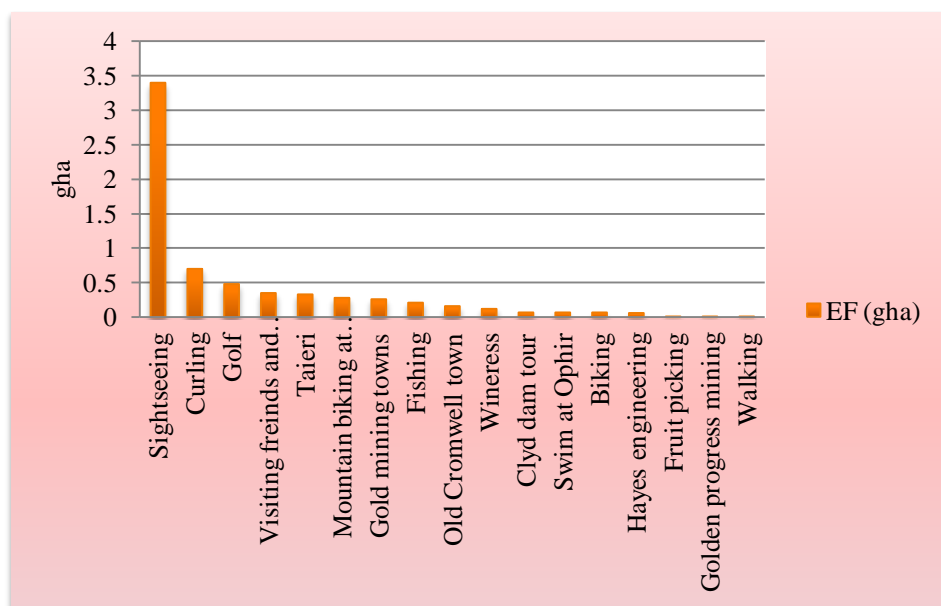


Figure 5.35: OCRT- the EF of visitor activities (2011)

Figure 5.36 compares the types of OCRT tourism activities by their EF per visitor. This figure shows a distinct difference between the EF of golfing (0.003 gha /visitor) and all other types of tourist activity.

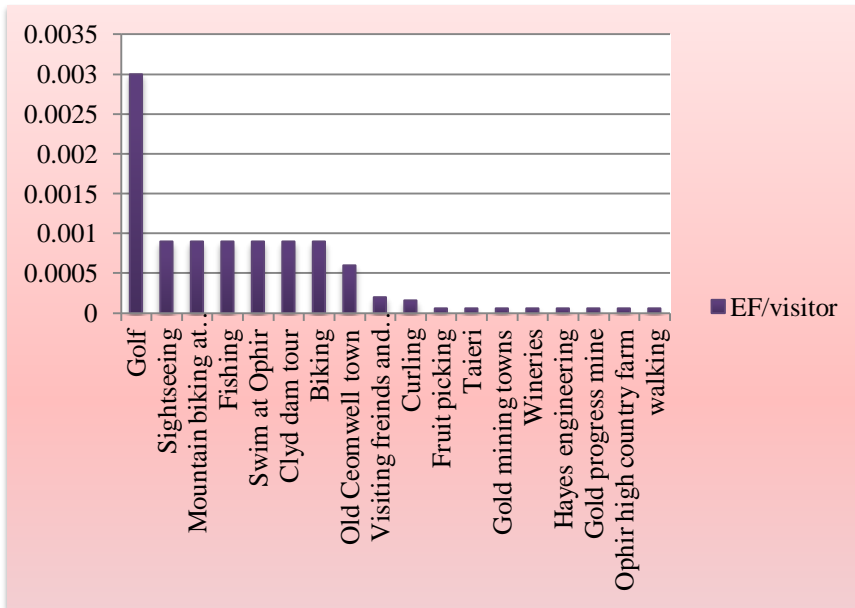


Figure 5.36: OCRT- the EF per visitor of activities (2011)

5.7.5.4. Comparison between the EFs of Indoor and Outdoor Activities

As shown in Table 5.83 and Figure 5.37 the EF of one OCRT indoor activity (curling at Naseby) is equivalent to 10.7% (0.7 gha) of the Total EF of OCRT visitor activities (6.57 gha). Likewise, the total EF of outdoor activities (5.85) accounts for 89.3% of the total EF of OCRT visitor activities (6.57gha). However, it should be noted that 8.1% (0.48) of the EF of outdoor activities (5.87) is the EF of golfing (0.48gha) which is conducted by just 1.3% (153) of total OCRT visitors (See Table 5.82 and Figure 5.35).

Table 5.83: Comparison between EFs of OCRT visitors - indoor and outdoor activities (2011)

Indoor activity (curling at Naseby)					Outdoor activities				
Numbers of visitors	% of total 26,077 visitor activities	EF (gha)	% ¹	EF (gha/visitor)	Numbers of visitors	% of total 26,077 visitor activities	EF (gha)	% ¹	EF (gha/visitor)
4,350	16.7	0.7	10.7	0.000016	21,727	83.3	5.87	89.3	0.0004

1. Percentage of total EF of OCRT visitor activities

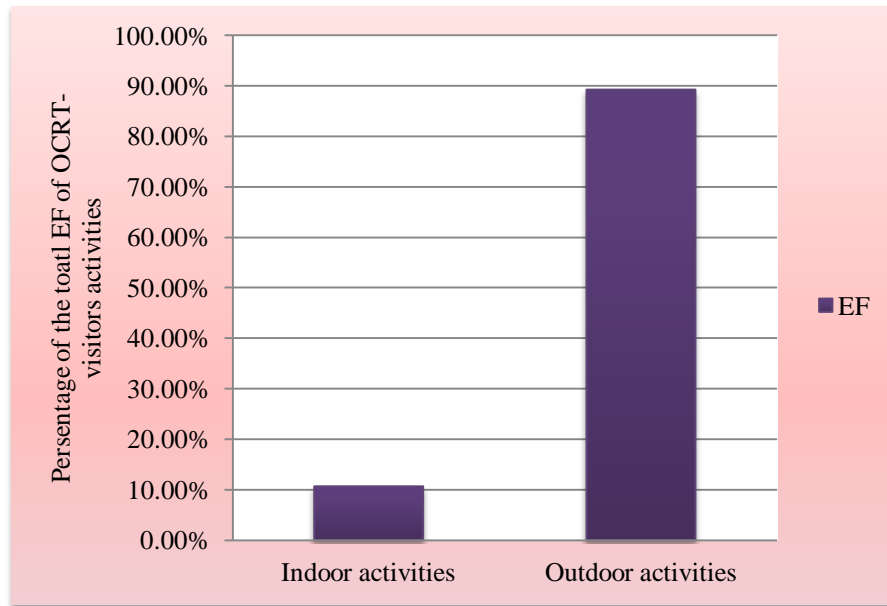


Figure 5.37: comparison between the EF of OCRT visitors indoor and outdoor activities.

This Thesis chooses three activities, curling at Naseby as an indoor activity, and golf as outdoor activity with the biggest EF/visitor, and walking with its low EF for further comparison. As Figure 5.38 illustrates, other activities (5.39 gha) has the biggest EF followed by, curling (0.7 gha), golf (0.48gha) and walking (0.004 gha).

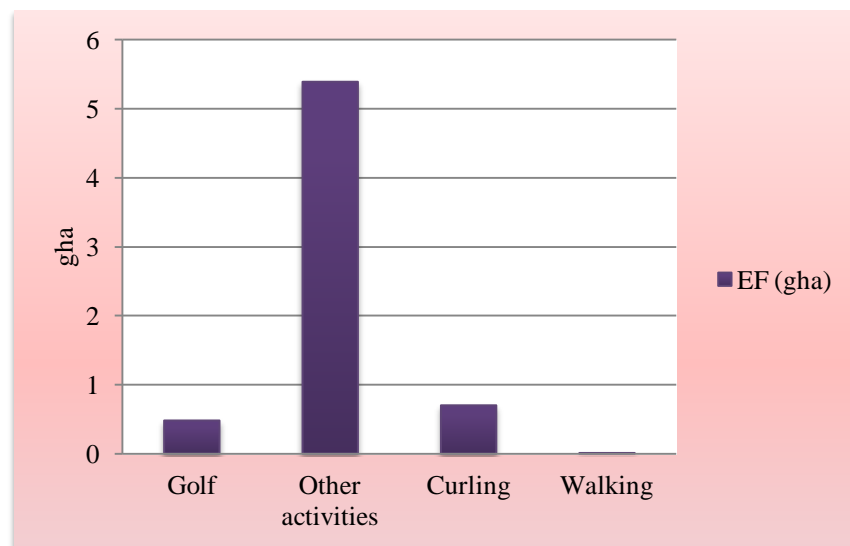


Figure 5.38: Comparison between the EFs of golf, curling, walking and other OCRT visitor activities (2011).

As illustrated in Figure 5.39, the majority of the 21,503 OCRT visitor activities fall into the other activities (except golf, curling and walking) category, followed by curling (4,350), golf (153) and walking (71).

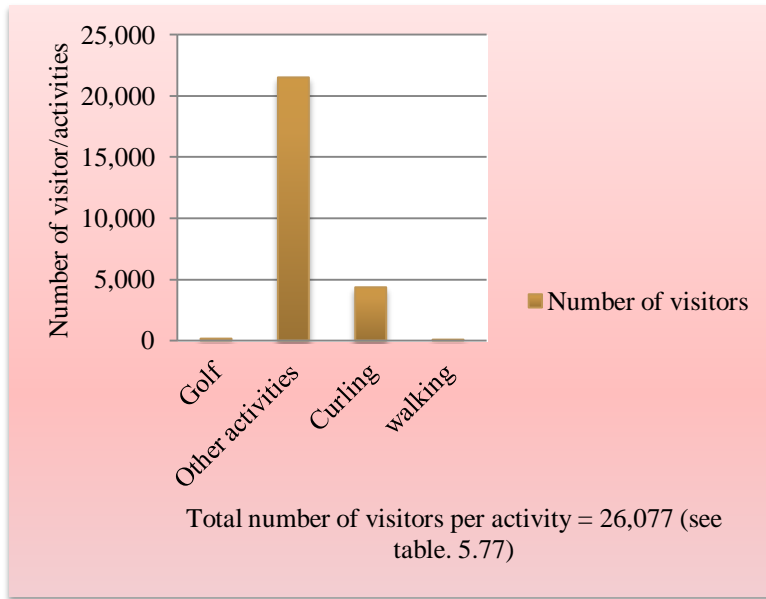


Figure 5.39: Comparison between the numbers of OCRT visitors who engage in golf, curling, walking and other activities (2011)

Figure 5.40 compares the EFs of these same four categories. Golf now dominates showing how a small number of people can have a large effect on overall EF.

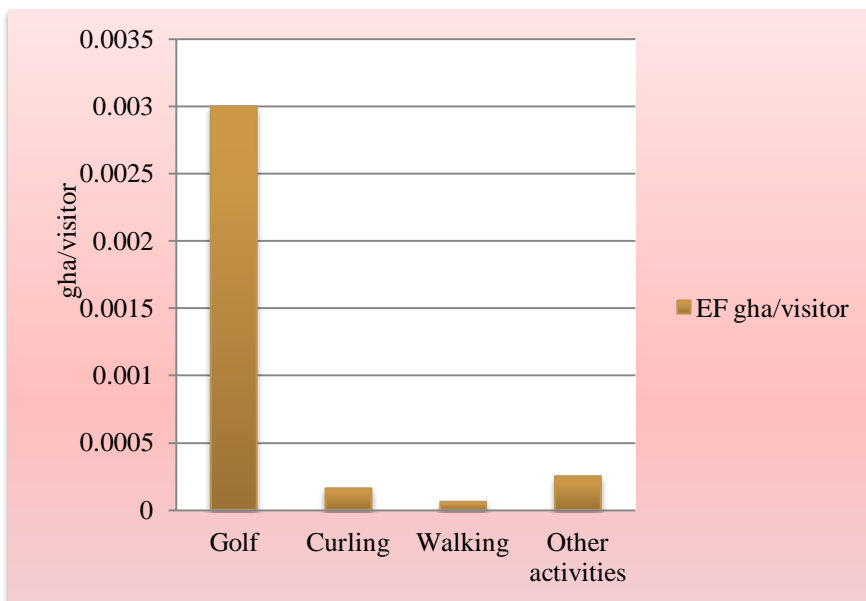


Figure 5.40: The EF (gha/visitor) of golf, curling, walking and other activities

5.8. The Total EF of OCRT (2011)

Table 5.84 demonstrates that the total EF of the OCRT is equivalent to 1,617 gha, which derives from the integration of the EFs of transportation, food, accommodation

services and activities used and engaged in by 11,788 OCRT visitors in 2011. As shown in Table 5.84 and Figure 5.41 transportation has the largest footprint of 1,167gha (72.2%) of the total EF, followed by 401.2 gha (24.8%) food, 42.24 gha (2.6%) accommodation services and 6.57 gha (0.4%) visitor activities. However, the total EF of transportation can be divided into 38.2% of total EF for international transportation and 34% for domestic transportation (Table 5.84). This shows the importance of getting to a tourist destination for overall environmental impact.

Category	EF (gha)	%	EF (gha/visitor ⁵)
Transportation	1,167 ¹	72.2 ⁵	0.1
Food	401.2 ²	24.8	0.034
Accommodation	42.4 ³	2.6	0.0036
Activities	6.57 ⁴	0.4	0.00056
Total	1,617	100	0.138

1. See Table 5.7
 2. See Table 5.11
 3. See Table 5.40
 4. See Table 5.82
 5. 72.2% includes 38.2% (617.4gha) EF International transportation + 34% (549.3gha) EF of domestic transportation (see Table 5.8)
 5. Total OCRT visitor numbers = 11,788 (see Figure 5.6)

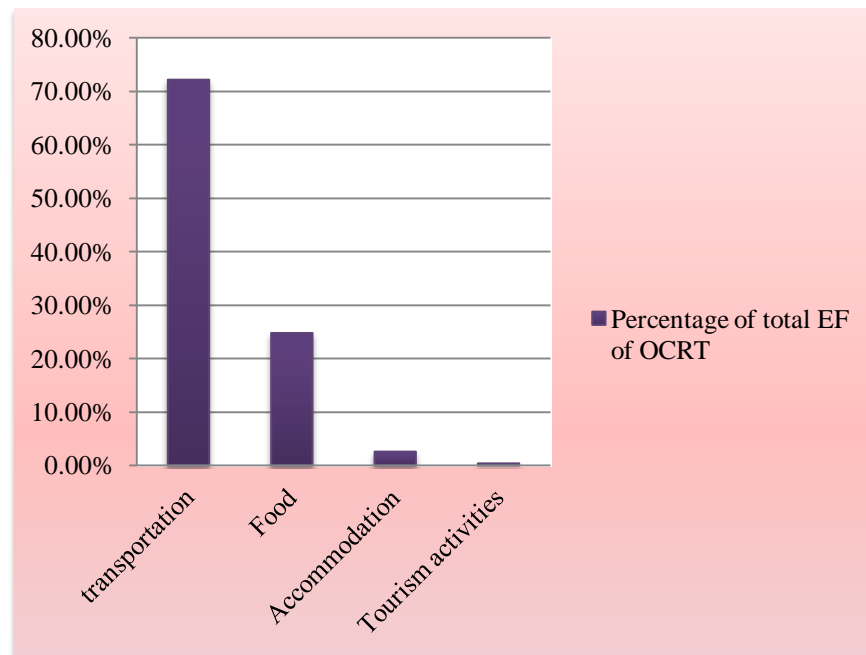


Figure 5.41: Comparison between the EF categories of OCRT- transportation, food, accommodation services and visitors activities (2011)

Figure 5.41.a compares the EF of OCRT visitors (0.138 gha/ capita), the present global average EF of holidays (0.3 gha/ capita) (Vale and Vale, 2009:358) and the sustainable EF (goal) for holidays (0.1 gha/ capita) (Vale and Vale, 2009:358). As illustrated, the EF of the OCRT is 66% smaller than the global average EF of tourism but its EF still needs to be reduced by 38% to be ecologically sustainable. According to O'Connor (2009:92) in 2008 the EF of New Zealanders was 5.9 gha/ capita. As a result the EF of OCRT visitors (0.136 gha) is equivalent to 2.3% of the EF of New Zealanders.

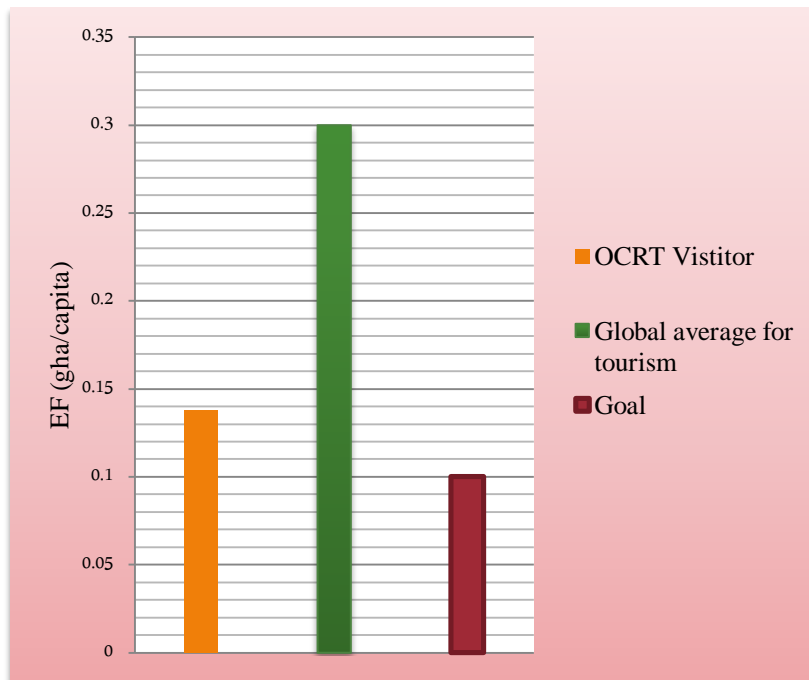


Figure 5.41.a: The average EF of OCRT- visitors and global tourism, and the goal for sustainable tourism (gha/ visitor)

5.9. OCRT: Overshoot Portion of EF

5.9.1. The EF of Sustainable living

Vale and Vale (2009:358) using data from the Cardiff Report (2001:97), propose the EFs of sustainable living for the ten categories of life activities and products shown in Table 5.85 and compare these proposed EFs with their present amounts. Vale and Vale (2009:358) classify the ten categories into the two areas of individual and collective products and activities (Table 5.85). The individual products and activities including; food and drink, domestic energy, domestic travel, stuff, housing, and holidays, are proposed to have EFs in the range of 0.03-0.43 gha/capita for being sustainable (Table 5.85). Moreover the sustainable EFs of the collective categories, including infrastructure, government, and services, are calculated to be in the range of 0.24-0.47 gha/capita

(Table 5.85). As shown in Table 5.85, the total EF of sustainable living (as the goal) is equivalent to 1.85 gha/capita and the total EF at present (2009) is 6.41gha/capita.

As presented in Table 5.85, the sustainable EF of holidays is calculated to be 0.03 gha/capita and, according to the Cardiff report (2001:97), this includes the EFs of transportation, food, accommodation and waste water that are consumed/used/produced by Cardiff visitors. This study uses the sustainable EF of holidays (Table 5.85) as the goal to be achieved through the sustainable development of the OCRT and compares its present EF with its target EF to calculate the overshoot portion of the current EF.

Table 5.85: The ecological footprint of sustainable living		
Individual	Now	Goal
Food and drink	1.33	0.43
Domestic energy	0.99	0.33
Domestic travel	0.99	0.33
Stuff	0.64	0.21
Housing	0.16	0.05
Holidays	0.10	0.03
Individual total	5.00	1.38
Collective		
Infrastructure	0.74	0.24
Government	0.41	0.14
Services	0.26	0.09
Collective total	1.41	0.47
Total revised footprint	6.41	1.85
• Reference: Vale and Vale, 2009:358		

Table 5.86 compares the present EF (0.138 gha/visitor) of the OCRT (see Table 5.84) and its goal (0.03 gha/visitor) for being environmentally sustainable. The difference between these two EFs (0.138 gha/visitor – 0.03 gha/visitor) shows the overshoot portion of the OCRT EF, which is 0.108 gha/visitor (Table 5.86).

Table 5.86: The ecological footprint of OCRT- sustainable tourism (2011)		
Overshoot portion of OCRT visitors- EF (gha/visitor/year)		
Now	Goal	Overshoot EF(gha/visitor/year)
0.138	0.03	0.108
• Total overshoot EF (gha) of 11,788 OCRT visitors = 1,273		

5.9.2. The Overshoot Portion of OCRT EF Energy

As $EF \text{ (gha)} = \text{energy used} \div 100 \text{ (carrying capacity of land)}$

Consequently

$\text{Energy used} = EF \text{ (gha)} \times 100 \text{ (carrying capacity of land)}$

As shown in Table 5.82 the EF of OCRT is 0.138, so its energy use is equivalent to:

$0.138 \text{ (gha/visitor)} \times 100 \text{ (carrying capacity of land)} = 13.8 \text{ (GJ/visitor)}$

Moreover its sustainable energy use is:

$0.03 \text{ (gha/visitor)} \times 100 \text{ (carrying capacity of land)} = 3.0 \text{ (GJ/visitor)}$

The overshoot portion of OCRT energy use is:

$13.8 \text{ GJ/visitor} - 3.0 \text{ GJ/visitor} = 10.8 \text{ GJ/visitor (Table 5.87).}$

Table 5.87: The energy use of OCRT sustainable tourism (2011)		
Overshoot portion of OCRT visitors- energy use (GJ/visitor/year)		
Now	Goal	Overshoot energy use (GJ/visitor/year)
13.8	3	10.8

As a result the overshoot energy use of 11,788 OCRT visitors is equivalent to:

$10.8 \text{ (overshoot energy use GJ/visitor/year)} \times 11,788 \text{ (visitors)} = 127,310.4 \text{ GJ/year}$
(Table 5.88).

Table 5.88: The energy use of OCRT- sustainable tourism (2011)		
Total overshoot portion of OCRT visitors energy use (GJ/year)		
Number of visitors	Overshoot energy use (GJ/visitor/year)	Total overshoot of OCRT visitors (GJ/year)
11,788	10.8	127,310.4

5.9.3. OCRT Overshoot Energy Use by Categories

The overshoot portion of each category (transportation, food, accommodation and visitor activities) is calculated through the following equation:

$\text{Overshoot portion of energy use per category (GJ/year)} = \% \text{ of its EF from total OCRT EF (gha)} \times \text{total overshoot energy use of OCRT (127,310.4 GJ/year)}$

For example using the above equation the overshoot portion of transportation is equivalent to 72.2% of 127,310.4 GJ/year, which is 91,918.1 GJ/year (Table 5.89). As shown in Table 5.89 transportation causes the largest overshoot energy use of 91,918.1 GJ/year, followed by food (31445.7 GJ/year), accommodation services (3310.1 GJ/year), and OCRT visitor activities (1018.4 GJ/year) (Table 5.89).

Table 5.89: OCRT overshoot energy use by categories (2011)

Category	EF (gha)	%	Overshoot portion of energy use (GJ/year)
Transportation	1,167	72.2	91,918.1
Food	401.2	24.8	31,573
Accommodation	42.4	2.6	3,310.1
Activities	6.57	0.4	509.2
Total	1,617	100	127,310.4

5.10. OCRT Economic Footprint

5.10.1. OCRT GDP

According to CODC (2011: 23) in 2011, the direct output of the OCRT was equivalent to \$8,159,042 and its total output was \$12,277,024 (Table 5.90). Likewise, in 2011 the OCRT direct contribution to GDP was \$4,213,793 and its total contribution to GDP was \$6,245,289 (Table 5.90). Table 5.90 also shows that in 2011 a total of 121 full time staffs were in employment related to the OCRT.

Table 5.90: The economic impact of the OCRT on the Central Otago/Otago economy

Impact summary	Direct	Total
Output	\$8,159,042	\$12,277,024
GDP	\$4,213,793	\$6,245,289
Employment (FTE's)	96.0	121.3

• Reference: Central Otago District Council (CODC), 2011:23

In 2011 of the total \$6,245,289 OCRT contribution, accommodation formed the majority of \$2,837,412 of total OCRT GDP followed by vehicles and equipment hire (\$975,119), and business administration and managerial services (\$900,602) (Table 5.91). Other categories included food and consumables, road passenger transport, retail, and entertainment, with GDP contributions in the range of \$61,925- \$782,795 (Table 5.91). Moreover, in comparison with other the categories, OCRT accommodation had the largest total output of \$5,301,246, followed by food and consumables (\$1,840,428), business administration and managerial services (\$1,736,101), and vehicles and equipment hire (\$1,735,894) (Table 5.91). Other categories including retail, road passenger transport, and entertainment had total outputs between \$452,305 and \$107,016 (Table 5.91).

Table 5.91: Economic impact of OCRT- by categories

Category	Output	Total output	GDP	Total GDP
Accommodation	\$3,557,833	\$5,301,246	\$1,956,837	\$2,837,412
Food and consumables	\$1,226,952	\$1,840,428	\$539,859	\$782,795
Retail	\$297,569	\$452,305	\$157,712	\$241,299
Road Passenger Transport	\$665,081	\$1,104,034	\$259,382	\$446,136
Vehicle and equipment hire	\$1,257,894	\$1,735,894	\$717,000	\$975,119
Business administration and managerial services	\$1,085,063	\$1,736,101	\$542,532	\$900,602
Entertainment	\$68,600	\$107,016	\$40,474	\$61,925
Total	\$8,159,042	\$12,277,024	\$4,213,793	\$6,245,289

• Reference: Central Otago District Council (CODC), 2011:23

5.10.2. OCRT: Sustainable Portion of GDP (GDPs)

As explained in Chapter 4 this thesis uses the sustainable portion of GDP (GDPs) as an economic indicator to evaluate OCRT economic development as being sustainable. Calculation of the GDPs of the OCRT involves the following four factors:

1. Total cost to generate 1GJ energy through using renewable resources in New Zealand
2. Total overshoot portion of OCRT energy use/year
3. Total cost to generate overshoot portion of OCRT energy use through using renewable resources
4. Total OCRT contribution to GDP

5.10.2.1. Renewable Energy Cost

Table 5.92 comprises the annualized cost to generate energy through using different technologies in the USA. As shown in this Table, in comparison with other energy technologies, using Solar photovoltaics (PV) costs the most at >\$0.20/kWh in 2005-2010, followed by wind offshore (\$0.10-0.17/kWh), and wave, tidal and concentrating solar power (CSP) at about the same cost (\$0.11-0.1/kWh). Interestingly, even at present geothermal, onshore wind and hydro-electricity (all classed as renewables) can work out cheaper than conventional energy sources (Table 5.92).

Table 5.92: Approximate fully annualized generation and conventional transmission cost for WWs power.

Energy technology	Annualized cost (~ 2007 US\$/kWh-delivered)	
	Present (2005-2010)	Future (2020 +)
Wind onshore	\$ 0.04-0.07	≤\$0.04
Wind offshore	\$0.10-0.17	\$0.08-0.13
Wave	≥US\$0.11	\$0.04
Geothermal	\$ 0.04-0.07	\$0.04-0.07
Hydro-electricity	US\$0.04	\$0.04
CSP (Concentrating Solar Power)	\$ 0.11-0.1	\$0.08
Solar PV	>\$0.20	\$0.10
Tidal	>\$0.11	\$0.05-0.07
Conventional (mainly fossil) generation in US	\$0.07 (social cost: \$0.12)	\$0.08 (social cost: \$0.14)

• Reference: Delucchi and Jacobson, 2011:1175

This thesis uses the average cost of using wind and solar technology in New Zealand to calculate the cost of generating 1GJ energy through using renewable energy resources. Table 5.93 shows New Zealand energy costs of using wind and solar systems. This table assumes that the average cost of using wind technology is NZ\$100/MWh (NZ\$0.1/kWh) and solar is \$NZ 42.5/MWh (\$NZ0.042/kWh). The cost for solar is based on the cost of \$350 to \$500 per MWh in New Zealand given by EECA (<http://www.energywise.govt.nz/how-to-be-energy-efficient/generating-renewable-energy-at-home/solar-electricity-generation#costs>) but reduced by a factor of 10 based on decreasing PV cost data from the National Renewable Energy Laboratory in the United States.(US Department of Energy (2011) 2010 Solar Technologies Market Report).

Table 5.93: New Zealand energy costs

Energy technology	Cost (NZ\$/MWh)	Average cost (NZ\$/MWh)
Wind	80-120 ¹	100
Solar system	35-50 ²	42.5
Average cost of energy generated by wind-solar systems (NZ\$/MWh)		71.25

1. Reference: New Zealand Wind Energy association, 2011. (<http://windenergy.org.nz/wind-energy/costs>)
2. Reference: www. Energywise.govt.nz
3. NZ\$1= US\$0.83 (<http://themoneyconverter.com>)

As presented in Table 5.94, the average cost of using wind and solar systems in New Zealand is assumed here to be NZ\$71.25/MWh or NZ\$19.8/ GJ.

Table 5.94: Average energy cost (wind-solar)

1 MWh	1 GJ ¹
NZ\$71.25	NZ\$19.8

• 1 MWh = 3.6 GJ

As shown in Table 5.95, in 2011 the total OCRT GDP was \$6,245,289 and its overshoot energy use is equivalent to 127,310.4GJ/year. Since the average cost of generating 1GJ of energy through using wind and solar systems is NZ\$19.8 (Table 5.95), the consequent cost of generating the total OCRT overshoot energy use is equivalent to $(127,310.4 \text{ GJ/year} \times \text{NZ\$}19.8) = \text{NZ\$}2,720,746$ (Table 5.95). The OCRT GDPs is equivalent to its total GDP (\$6,245,289) less the total cost to generate the overshoot portion of its energy use by wind-solar systems $(\text{NZ\$}2,720,746) = \text{NZ\$}3,524,543$ (Table 5.95).

Total OCRT GDP (NZ\$)	6,245,289 ¹
EF (gha)	1,617 ²
Overshoot EF (gha)	1,273 ³
Overshoot energy use (GJ)	127,310.4 ⁴
Energy cost (NZ\$/GJ) wind-solar	19.8 ⁵
Total cost (NZ\$) to generate the overshoot portion of OCRT energy use by wind-solar systems	2,720,746
GDPs (NZ\$) ⁶	3,524,543
1. See Table 5.91	
2. See Table 5.89	
3. See Table 5.89	
4. See Table 5.89	
5. See Table 5.94	
6. GDPs = Total GDP - Total cost to generate the overshoot portion of energy use through the use of renewable resources	

Figure 5.42 makes a comparison between OCRT GDP and its GDPs. As illustrated OCRT GDPs is NZ\$ 2,720,746 (43.6%) less than OCRT GDP (NZ\$6,245,289). On the other hand, 43.6% of total OCRT GDP must be spent to reduce its environmental impacts to the level of sustainable living as it relates to the EF of holidays, as cited in Table 5.87. As explained above, the calculation of GDPs is based on the assumption of the reducing cost of solar energy following historic cost trends.

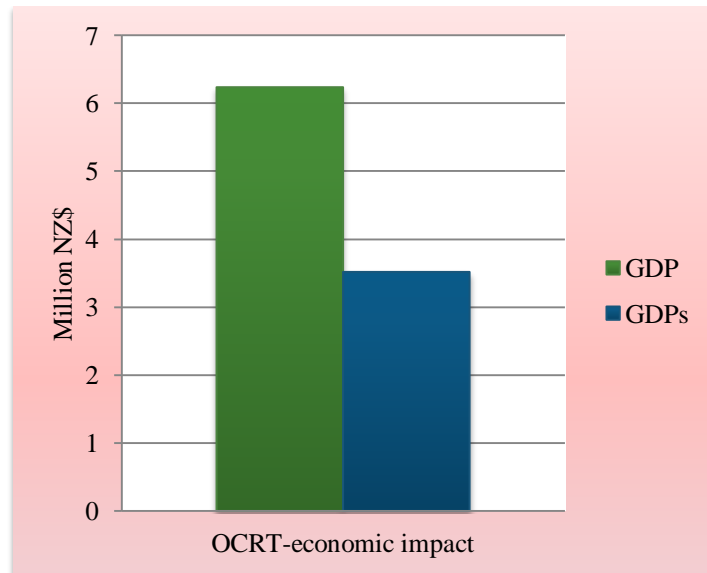


Figure 5.42: OCRT- GDP and GDPs

5.11. OCRT Cultural Footprint (CF)

This Thesis uses the CF model explained in Chapter 4 to explore the cultural footprint of the OCRT on the host destination. In this case, study of the CF of the OCRT is related to the three categories of the CFs of food, accommodation, and visitor activities. Since there is no suggestion about using sustainable transportation on any OCRT websites and all current transportation is of conventional type, the CF of this category is not included in this research. Moving to sustainable transport is considered here to be a national rather than a local issue when it comes to tourism. Nevertheless, it must still be recognised that the largest component of the tourism EF relates to visitor transportation. Local sustainable transport as it relates to tourism is an area for further research.

5.11.1. OCRT CF: Food

Table 5.96 contains summarised results of two proposed scenarios for OCRT food production (see Chapter 5-5.5.1 and 5.5.2). As shown in Table 5.96 the total conventional food consumed in the first scenario is 78,508.45kg (100% of consumed food) and in the second scenario this same total is made up of 65165.05kg (83%) conventional food and 13346.4 kg (17%) home generated (organic food).

The total EF of OCRT food in the first scenario is 424.4gha/ year and in the second scenario this reduces by 5.5% to 401gha/year. Obviously more use of local food would not

just be an advertising advantage for OCRT tourism but would also reduce its environmental impact.

As shown in Table 5.96, in the second scenario the overshoot portion of the energy related to the food consumed is 31,573 GJ/year. This is calculated by working out the EF of providing the same food in a sustainable way. As shown in Table 5.86, in the overall OCRT, overshoot EF is 0.108gha/visitor, and the total overshoot in 2011 was 1,273gha.

Since the EF of consumed food in the first scenario (EF1) is 23.2 gha bigger than the EF of food in the second scenario (EF2), the overshoot portion of the energy related to food consumed in the first scenario is calculated through the following steps:

$$EF1 - EF2 = 23.2 \text{ gha}$$

$$\text{Overshoot energy of the first compared to the second scenario} = 23.2 \text{ gha} \times 100 \text{ (average global carrying capacity)} = 2,320 \text{ GJ/year}$$

Since the overshoot portion of energy use related to the current situation with regard to food eaten by visitors to the OCRT has already been calculated (see Table 5.89), it is used as a base to calculate the overshoot energy related to the first scenario through the following steps.

$$\text{Overshoot energy consumed food (second scenario)} = 31,573 \text{ (GJ/year)}$$

$$\text{Overshoot portion of energy used of the first scenario} = 31,573 \text{ GJ/year (overshoot energy second scenario)} + 2,320 \text{ GJ/year (difference between first and the second scenarios expressed as energy)} = 33,893 \text{ GJ/year (Table 5.96).}$$

Moreover the overshoot portions of EF2 and EF1 are calculated by dividing their overshoot energy into 100 (average carrying capacity of the land) (Table 5.96). Consequently the overshoot portion of EF2 is $31,573 \div 100 = 315.73 \text{ gha/year}$ (see Table 5.96) and the overshoot portion of EF1 is $33,893 \div 100 = 338.93 \text{ gha/year}$ (see Table 5.96). As the cost to generate 1GJ energy through using wind-solar systems is NZ\$19.8, the cost to generate the overshoot energy of food in the first scenario is $33,893 \text{ GJ} \times \text{NZ\$ } 19.8 = \text{NZ\$}671,081$ (see Table 5.96). Likewise the total cost to generate the overshoot energy through using wind-solar systems in the second scenario is $\text{NZ\$}19.8 \times 31,573 \text{ GJ/year} = \text{NZ\$}625,145$ (Table 5.96).

As shown in Table 5.96, the food GDP in both scenarios is NZ\$782,795. As a result

$$\text{GDPs}_1 = \text{NZ\$782,795 (GDP)} - \text{NZ\$671,081} = \text{NZ\$111,417}$$

$$\text{and } \text{GDPs}_2 = \text{NZ\$782,795(GDP)} - \text{NZ\$625,145} = \text{NZ\$157,650}$$

The difference between GDPs₁ and GDPs₂ gives the NZ\$45,936 of contribution to GDPs through producing 13,346.4kg home generated (organic) food by OCRT accommodation services. In addition it can be considered that producing 1kg home generated (organic) food increases GDPs by NZ\$3.44 (NZ\$45,936÷13,346.4kg) (Table 5.96).

First scenario (100% conventional food)		Second scenario (83% conventional food and 17% home generated (Organic) food)	
Total conventional food (kg)	78,508.45	Total conventional food (kg)	65165.05
Total home generated food (kg)	0.00	Total home generated food (kg)	13,346.4
Total EF of consumed food gha/year – (EF1)	424.4	Total EF of consumed food gha (EF2)	401.2
Overshoot portion of energy of consumed food (GJ/year)	33,893	Overshoot portion of energy of consumed food (GJ/year)	31,573 ¹
Overshoot portion of EF1 (gha/year)	338.93	Overshoot portion of EF2 (gha/year)	315.73
Cost to generate 1GJ energy through using wind-solar systems (NZ\$)	19.8	Cost to generate 1GJ energy through using wind-solar systems (NZ\$)	19.8
Total cost to generate overshoot energy through wind-solar systems (NZ\$)	671,081	Total cost to generate overshoot energy through wind-solar systems (NZ\$)	625,145
Total food GDP (NZ\$)	782,795	Total food GDP (NZ\$)	782,795
Total food GDPs ₁	111,714	Total food GDPs ₂	157,650
1. See Table 5.89			
• Increased portion of GDPs influenced by using 13,346.4 (kg) home cooked food = NZ\$ 45,936= NZ\$ 3.44/ kg			

5.11.1.1. Sustainable Life: Food (Ideal Model)

Table 5.96 shows that the present EF of the 78,508.45kg OCRT food consumed (second scenario) is 401.2 gha and its overshoot portion of EF2 is 315.73gha. As a result the sustainable EF of OCRT food consumed can be determined through the following equation:

$$\text{a. } 401.2 \text{ gha (EF2)} - 315.73\text{gha (overshoot portion of EF2)} = 85.47\text{gha} = \text{sustainable life EF of OCRT food}$$

In the ideal model for OCRT food consumed, since the overshoot portion of energy use is equal to zero, the GDPs is equal to the total GDP of OCRT food (NZ\$782,795, see Table 5.96). This study uses the ideal model of OCRT food consumed by visitors to

compare the two scenarios shown in Table 5.96 with the sustainable life model for food consumption.

As shown in Figure 5.43, the area of the triangle described by 'Q 1, EF 1, and GDPs1' illustrates ordinary life, or the area in which all OCRT visitors consume 100% (78,508.45 kg) conventional food (first scenario). In this area, the development of the OCRT does not exert any influence on its host destination and visitors to produce and consume local food. In Figure 5.43 the EF of using 100% conventional food (EF 1) is 424.4 gha/ year and this figure is used to represent 100% of the EF of OCRT food consumed by visitors. In the ordinary life area, GDPs1 is NZ\$111,714 (see Table 5.96).

Comparison between the first scenario and the ideal model of OCRT food consumption indicates that in the first scenario EF 1 (424.4 gha) is 79.9% bigger than the ideal EF for food consumption (85.47gha-see 5.11.1.1.a) (Figure 5.43 and Table 5.96). Moreover, as shown in Figure 5.43 in the first scenario, GDPs1 is equal to 14.3% of the total GDP of OCRT food. On the other hand, 85.7% of the total GDP of food must be spent to change EF 1 to the ideal EF through generating the overshoot portion of food energy use by using wind-solar systems.

In Figure 5.43, the area of the triangle 'Q 2, EF2, and GDPs2' determines the area of the OCRT CF through producing and consuming home generated (organic) food. As demonstrated in Figure 5.43 in the CF, total food consumed by OCRT visitors Q 2 (78,508.45 kg) is divided into the two portions of 17% (13,346.4) home cooked food (Q 3) and 83% (65,165.05 kg) conventional food (Q 4). The GDPs2 in the area of the CF is NZ\$157,650, which is 5.8% (NZ\$45,936) more than GDPs1(NZ\$111,714) in the ordinary life area (Table 5.96).

Figure 5.43 and Table 5.95 indicate that using 17% home generated (organic) food reduces the total EF (EF 1) of OCRT food consumed by 5.5% (shown in Figure 5.43 as R-EF1). Moreover, as illustrated in Figure 5.43, producing 17% local food increases GDPs1 by 5.8% (NZ\$ 45,936), shown in the figure as (I) GDPs1.

Comparison between the ideal model and present pattern of OCRT food consumption shows that EF2 (401.2 gha) is 74.4% (315.7 gha) more than the ideal EF (85.47gha) and

79.9% (NZ\$625,145) of the GDP (NZ\$782,795) of food must be spent to reduce this overshoot portion of EF2 to the ideal EF (Table 5.96 and Figure 5.43).

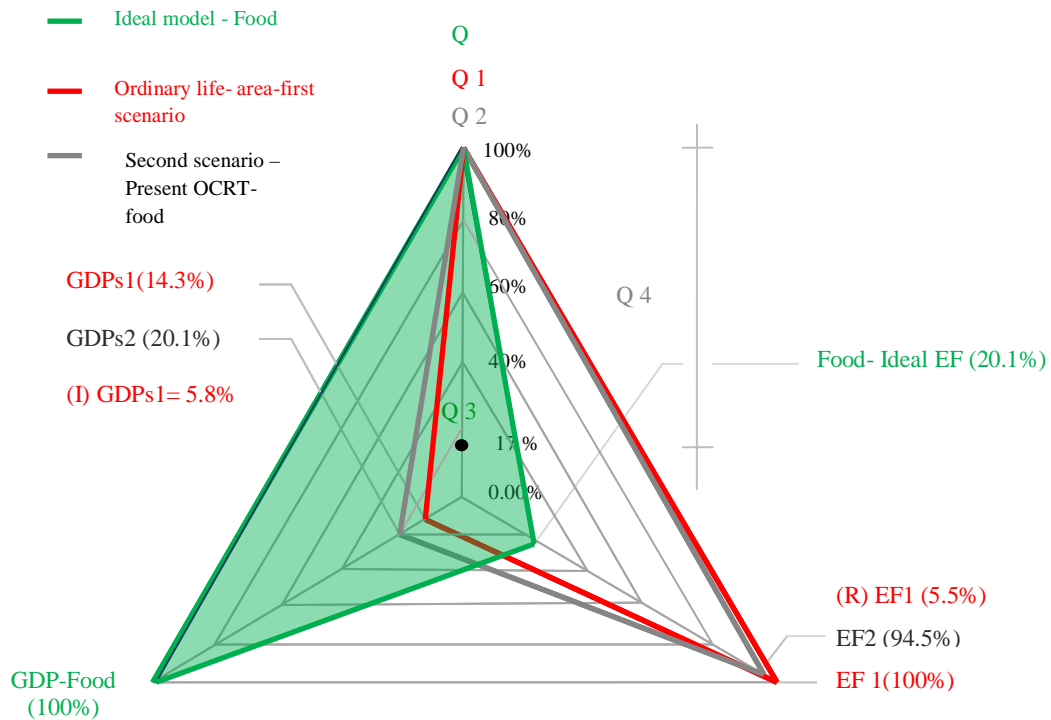


Figure 5.39: The cultural footprint (CF) of OCRT visitors' food

- Q: 100% local food in ideal model
- Q 1: 100% conventional food – first scenario
- Q 2: 83% conventional food + 17% home generated food - second scenario
- Q 3: 17% home generated food (second scenario)
- Q 4: 83% conventional food (second scenario)
- GDPs1: sustainable portion of GDP – first scenario
- GDPs2: Sustainable portion of GDP – second scenario
- (I) GDPs1: increased portion of GDPs1
- EF 1: ecological footprint of food- first scenario
- EF2: ecological footprint of food- second scenario
- R- EF 1: reduced portion of total EF 1 of consumed food

5.11.2. OCRT CF: Accommodation Services

This study explores the CF of the 788 OCRT accommodation services through using three scenarios. In the first scenario, all buildings used as accommodation services are assumed to be newly constructed buildings (NB) without any open air areas (veranda and balcony). In the second scenario 10% of OCRT accommodation buildings are RB and 90% are NB. In addition, in the second scenario all areas of buildings including indoor and outdoor (V/B) spaces are calculated as indoor spaces. In the third scenario 90% (58,972 m²) of buildings are NB, 10 % (21,378 m²) are RB and 387 m² of total building area is outdoor sitting space (V/B) (Table 5.97).

The third scenario determines the present quantity, quality, EF and GDPs of the OCRT accommodation services. Comparison between the EFs and GDPs of the first and the second scenario indicates the ecological and economic effects of using RB buildings (as cultural heritage and capital) on a host destination. Likewise, comparison between the second and third scenario suggests the environmental and economic footprint of using open air areas (V/B) in accommodation services as an element of architecture. In addition, comparison between the first and third scenario reflects the total environmental and economic effects of using RB buildings as accommodation services and V/B as a part of architecture.

Table 5.97 shows that in the first scenario the total EF of using 100% (80,356 m²) NB as accommodation services is 50.5 gha, and the total GDP of OCRT accommodation services is equivalent to NZ\$2,837,412 (see Table 5.91). Since the overshoot portion of energy use related to the third scenario (current situation) has already been calculated (see Table 5.89), it is used as a base to calculate the overshoot energy related to the first and second scenario through the following steps:

Overshoot energy use (third scenario) = 3,310.1 GJ/year

EF 1: Ecological footprint of accommodation services (first scenario) = 50.5 gha/year

EF 3: Ecological footprint of accommodation services (third scenario) = 42.4 gha/year

Increased in EF 1 relative to EF 3 = (EF 1) – (EF 3) = 50.5 – 42.4 = 8.1 gha/year

Increased portion of overshoot energy for first scenario relative to third scenario = 8.1 gha × 100 GJ/gha (global average carrying capacity of land) = 810 GJ

The overshoot energy of the first scenario = 810 GJ + 3,310.1 GJ (overshoot energy of the third scenario) = 4,120.1 (Table 5.97).

As the cost to generate 1GJ of energy using wind-solar systems is NZ\$19.8, consequently the total cost to generate the overshoot energy of the first scenario is: NZ\$19.8 × 4,120.1 GJ = NZ\$81,578.

GDP earned through OCRT accommodation services in all three scenarios is equivalent to NZ\$2,837,412. The sustainable portion of GDP in the first scenario (GDPs1) is equivalent to: NZ\$ 2,837,412 (total OCRT accommodation GDP) - NZ\$ 81,578 (cost to generate overshoot energy of the first scenario) = NZ\$2,755,834.

In the second scenario, the area of OCRT accommodation buildings (80,356 m²) is divided into the two parts of NB buildings (58,972 m²) and RB buildings (21,378 m²) (Table 5.96). In the second scenario the total EF of OCRT accommodation services (EF2) is 43.2 (gha) and total accommodation GDP is NZ\$2,837,412, as for GDP in the first scenario.

The overshoot energy use for the third scenario is used as a base to calculate the overshoot energy use of OCRT accommodation services in the second scenario through the following steps:

Overshoot energy use (third scenario) = 3,310.1 GJ/ year

EF2: Ecological footprint of accommodation services (second scenario) = 43.2 gha/year

EF 3: Ecological footprint of accommodation services (third scenario) = 42.4 gha/year

Increased portion of EF2 over EF 3 = (EF2) – (EF 3) = 43.2 – 42.4 = 0.8 gha

Increased overshoot energy use of second scenario relative to third scenario = 0.8 gha × 100 GJ/ gha (global average carrying capacity of land) = 80 GJ

The overshoot energy use of the second scenario = 80 GJ + 3,310.1 GJ (overshoot energy use of the third scenario) = 3,390.1 GJ (Table 5.97)

As the cost to generate 1 GJ of energy through using wind-solar systems is NZ\$19.8, the total cost to generate the overshoot energy of the second scenario is: NZ\$19.8 × 3,390.1 GJ = NZ\$67,124 (Table 5.97). The sustainable portion of GDP in the second scenario (GDPs2) is equivalent to: NZ\$ 2,837,412 (total OCRT accommodation GDP) - NZ\$67,124 (cost to generate overshoot energy of the second scenario) = NZ\$2,770,288 (Table 5.97).

In the third scenario, the area of OCRT accommodation buildings (80,356 m²) is divided into the two areas of NB buildings (58,972 m²) and RB buildings (21,378 m²) (Table 5.97). In this scenario the total area (80,356 m²) of NB and RB is made up of 378 m² V/B and 79,978 m² indoor spaces.

In the third scenario the total EF of OCRT accommodation services (EF 3) is equivalent to 42.4 (gha) and total accommodation GDP is NZ\$2,837,412, the same as GDP in the first and second scenarios (Table 5.97). EF 3 that contains the EFs of NB and RB build-

ings and open air spaces (V/B) used as part of the accommodation services is the present EF of OCRT accommodation services (Table 5.97).

As shown in Table 5.97, the total overshoot energy use in the third scenario (the present overshoot energy of OCRT accommodation services) is 3,310.1 GJ. Since the cost to generate 1 GJ of energy through using wind-solar systems is NZ\$ 19.8, then the total cost to generate 3,310.1 GJ through using wind-solar systems is: NZ\$19.8 × 3310.1(GJ) = NZ\$65,540 (Table 5.97).

Table 5.97: OCRT- Accommodation services- CF (2011)

First scenario		Second scenario		Third scenario	
All OCRT accommodation buildings are NB		90 % of 788 OCRT accommodation buildings are NB and 10 % RB (V/B not considered)		90% of 788 accommodations (including camp sites and buildings) are NB and 10% are RB buildings including 387m ² V/B	
Total number of accommodation services	788 ¹	Total number of accommodation services	788	Total number of accommodation services	788
NB accommodation area (m ²)	80,356 ²	NB accommodation area (m ²)	58,972 ²	NB accommodation area (m ²)	58,972 ²
RB accommodation area (m ²)	0.00	RB accommodation area (m ²)	21,378 ²	RB accommodation area	21,378 ²
Total EF (EF 1) (gha)	50.5 ³	Total EF (EF2) (gha)	43.2 ⁴	Total EF (EF 3) (gha)	42.4
GDP (NZ\$)	2,837,412	GDP (NZ\$)	2,837,412	GDP (NZ\$)	2,837,412
Overshoot energy use (GJ/year)	4,120.1	Overshoot energy use (GJ/year)	3,390.1	Overshoot energy use (GJ/year)	3,310.1
Cost to generate 1 GJ energy using wind- solar systems (NZ\$)	19.8	Cost to generate 1 GJ energy using wind- solar systems (NZ\$)	19.8	Cost to generate 1 GJ energy using wind- solar systems (NZ\$)	19.8
Cost to generate 4,120.1 GJ energy using wind-solar systems (NZ\$)	81,578	Cost to generate 3390.1GJ energy using wind-solar systems (NZ\$)	67,124	Cost to generate 3,310.1 energy using wind-solar systems (NZ\$)	65,540
GDPs1	2,755,834	GDPs2	2,770,288	GDPs3	2,771,872
1. See Table 5.15					
2. See Table 5.23 (the sum of areas include 378m ² V/B)					
3. See Table 5.36					
4. See Table 5.37					

The GDPs of the third scenario GDPs 3 (the present GDPs of OCRT accommodation services) is calculated through the following equation:

GDPs 3 = NZ\$2,837,412 (total GDP of OCRT accommodation services) – NZ\$65,540 (cost to generate 3,310.1 GJ energy through using wind-solar systems) = NZ\$2,771,872 (Table 5.97).

5.11.2.1. Sustainable living OCRT Accommodation Services (Ideal Model)

This section determines an ideal model for OCRT accommodation services such that the EF is in an environmentally sustainable range. The GDPs for this model is then calculated. This ideal model is used to compare each of the three scenarios for OCRT accommodation services (Table 5.96) with an environmentally and economically sustainable version to explore how using RB buildings as accommodation and V/B as parts of architecture (as social behaviours) can contribute to achieving this ideal model.

a. Sustainable EF

As shown in Table 5.97 the total overshoot energy of OCRT accommodation services at present is 3,310.1 GJ/year. As a result the overshoot portion of the EF can be calculated through the following steps:

Overshoot portion of the EF of OCRT accommodation services = 3,310.1 GJ (overshoot energy use) ÷ 100 (carrying capacity of land) = 33.1 gha

Table 5.96 shows that EF 1 (present EF of OCRT accommodation services) is 42.4 gha

So the sustainable EF of OCRT accommodation services is equivalent to:

42.4 gha (present EF of OCRT accommodation services) – 33.1gha (overshoot portion of the EF of OCRT accommodation services) = 9.3 gha

b. Sustainable Living GDPs

Since for sustainable living the EF of accommodation services is not in overshoot, consequently, in this position both the overshoot energy use and the cost to generate this through using wind-solar systems are zero. Consequently: assuming that the Ideal model has the same GDPs as the current model, GDPs of sustainable accommodation services = Total GDP of accommodation services – 0.00 (total cost to generate overshoot energy of accommodation services) = Total GDP of accommodation services = NZ\$2,837,412 (see Table 5.97).

5.11.2.2. Comparison between the Ideal Model, First and Second Scenarios

Figure 5.44 comprises the quantities, EF and GDPs of OCRT accommodation services for the ideal model and first and second scenarios as discussed above. This figure gives the opportunity to explore the ecological and economic influences exerted by using RB buildings as accommodation on the host destination.

As shown in Figure 5.44, in the ideal model of accommodation services, Q is 100% of the OCRT accommodation area (80,356 m²) with an EF of 9.3 gha EF and a GDPs of NZ\$ 2,837,412, which is equal to 100% of the GDP of OCRT accommodation services. In the ideal model as discussed above the overshoot portion of EF and energy use are zero. In the first scenario, Q1 is the total area of OCRT accommodation services (80,356 m²) for which 100% of accommodation services are assumed to be new buildings (NB) (Figure 5.44). In the second scenario as illustrated in Figure 5.44, Q 2 is the OCRT accommodation area (80,356 m²) divided into the two parts; 73.4% (58,972 m²-see Table 5.97) NB and 26.6% (21,378 m²-see Table 5.97) RB.

In Figure 5.44, EF 1 is the biggest EF in comparison with the EFs of the other scenarios and it is considered as the 100% EF benchmark. Moreover, in Figure 5.44, EF2 and ideal EF are compared with EF 1 in percentage terms.

As shown in Figure 5.44, in the ideal model of OCRT accommodation services the acceptable EF is 9.3 gha or 18.4% of EF 1 (EF 1 is 50.5gha-see Table 5.96). Alternatively, in the first scenario in which all accommodation is assumed as NB, the EF (EF 1= 50.5gha) is 82% bigger than the sustainable EF (ideal EF= 9.3gha).

As illustrated in Figure 5.44, the EF of OCRT accommodation services in the second scenario (EF2= 43.2gha- see Table 5.97) is 85.4% of EF 1(50.5). Consequently in this scenario (R) EF 1 (reduced portion of EF 1) is equal to 14.6% of EF 1= 7.3 gha.

As shown in Figure 5.40, the total GDPs1 (GDPs of the first scenario = NZ\$2,755,834) is equal to 97.1% of total GDP of OCRT accommodation services (NZ\$2,837,412). On the other hand, in the first scenario 2.9% (NZ\$82,285) of the total GDP of OCRT accommodation services must be spent to generate the overshoot portion of accommodation energy use through wind-solar systems to change EF 1 to the ideal EF.

Figure 5.44 determines that GDPs2 (NZ\$2,770,288-GDPs of second scenario) is equal to 97.6% of total OCRT accommodation GDP (NZ\$2,837,412). Indeed in the second scenario 2.4% (NZ\$68,098) of the total GDP of OCRT accommodation services must be spent to generate the overshoot portion of OCRT accommodation energy use through wind-solar systems to reduce EF2 to an ideal EF. Likewise, as determined in Figure 5.44, (I) GDPs1 (increased portion of GDPs1) is equal to 0.5% of total OCRT accom-

modation GDP. This means using 21,378 m² (26.6% of total OCRT accommodation services area) of accommodation buildings as RBs contributes to an increase of 0.5% in GDPs1.

5.11.2.3. Comparison between the Ideal Model, Second and Third Scenarios

As shown in Figure 5.44, in the third scenario Q 3 is the total area of OCRT accommodation services in which 73.4% (58,972 m²) of the area is NB and 26.6% (21,378 m²) is RB. Furthermore, in the third scenario of total Q 3 (80,356 m²) 387 m² (0.5%) is V/B and 79,996 m² (99.5%) is indoor spaces (Figure 5.44).

In the third scenario, the total EF of OCRT accommodation services (EF 3) is 42.4 gha (see Table 5.97) which is equal to 84% of EF 1 (Figure 5.44). As shown in Figure 5.44, EF 3 (84% of EF 1) is 1.5% smaller than EF2 (85.5% of EF 1). On the other hand (R) EF2 is equivalent to (EF2) – (EF 3) = 1.5% of EF 1 (EF of the first scenario that is used as a base or 100% EF of OCRT accommodation services). EF 3 is the present EF of OCRT accommodation services, which is still 65.6% (84%-18.4%) bigger than the ideal EF, and is shown in Figure 5.44.

Figure 5.44 and Table 5.97 show that the GDPs of the third scenario (GDPs 3) which is the present GDPs of OCRT accommodation services is 1% (NZ\$28,374 of NZ\$2,837,412) more than GDPs2. Furthermore, GDPs 3 is 2.3% (NZ\$ 65,261) less than the total GDP (NZ\$2,837,412) of OCRT accommodation services (Figure 5.44 and Table 5.97). This means (I) GDPs2 is influenced by using 387 m² V/B at a value equal with 1% of total GDP of OCRT accommodation services. In addition, Figure 5.40 shows that in the third scenario (present circumstance of OCRT accommodation services) 2.3% (NZ\$65,260) of its GDP must be spent to generate its overshoot portion of energy use through using wind-solar systems to reduce its present EF to the ideal EF.

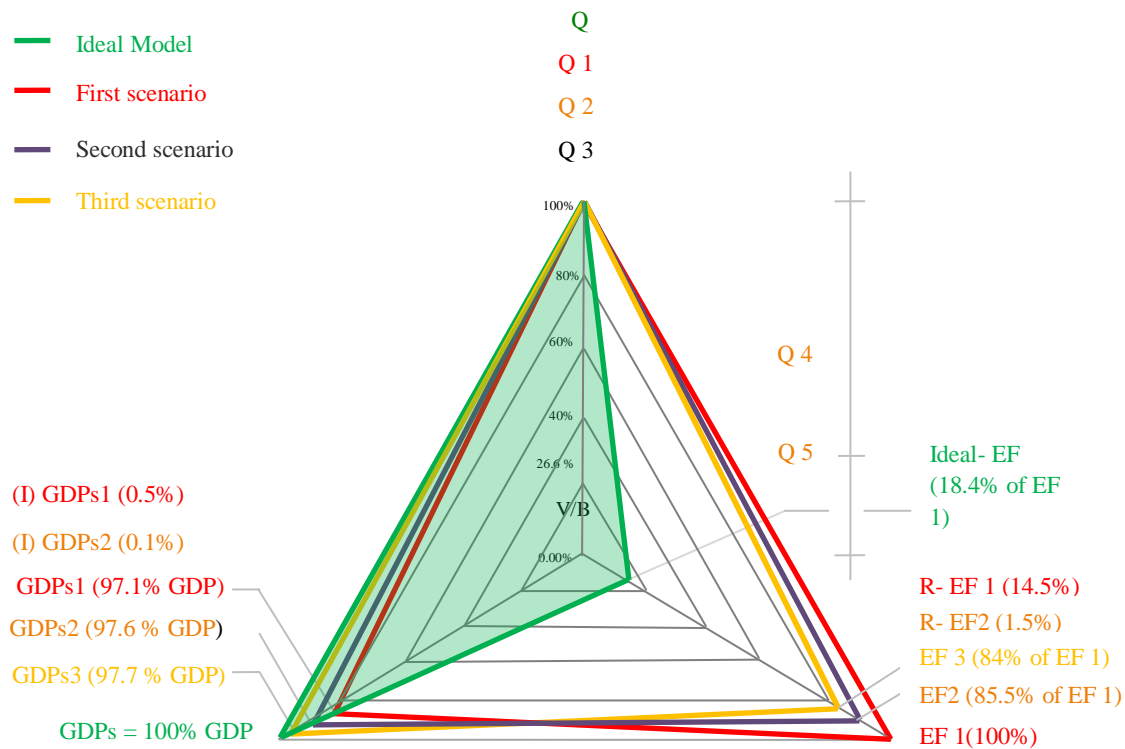


Figure 5.44: The CF of OCRT accommodation services- using RB buildings and V/B as parts of accommodation services

- Q: (100%) area of 788 OCRT accommodation services (80,356 m²) - ideal model
- GDP: Total NZ\$2,837,412 GDP of OCRT accommodation services (see Table 5.95)
- GDPs: Total sustainable portion of OCRT accommodation services – ideal model
- Q 1: Total (100%) area of 788 OCRT accommodation services (80,356m²) – 100% NB accommodation services - first scenario
- EF 1: Total EF of OCRT accommodation services - first scenario
- (R) EF 1: Reduction of OCRT EF 1 influenced by using RB buildings as OCRT accommodation services
- GDPs1: Total GDPs of OCRT accommodation services - first scenario
- (I) GDPs1: Increased portion of GDPs1 from using RB buildings as part of OCRT accommodation services
- Q 2: Total (100%) area of 788 OCRT accommodation services (80,356m²); 73.4% (58,972m²) NB and 26.6% (21,378m²) RB - second scenario
- Q 3: Total (100%) area of 788 OCRT accommodation services (80,356m²); 73.4% (58,972m²) NB and 26.6% (21,378m²) RB. Of total Q 3 (80,356m²) 387m² (0.5%) is V/B and 79,996m² is indoor spaces - third scenario
- Q 4 (NB area): 73.4% (58,972m²) of total OCRT accommodation area (80,356m²) - second scenario
- Q 5 (RB area): 26.6% (21,378m²) of total OCRT accommodation area (80,356m²)- second scenario
- EF2: EF of 80,356m² OCRT accommodation services (Q 2) including EFs of Q 3 and Q 4
- GDPs2: Total GDPs of OCRT accommodation services - second scenario

5.11.3. The CF of OCRT Visitor Activities

5.11.3.1. Overshoot EF of OCRT Visitor Activities

As shown in Table 5.98, other activities (excepting curling, golf and walking) have the largest share at 82% (5.39 gha) of the total EF of OCRT activities (6.57gha), followed by curling (10.65%), golf (7.3%) and walking (0.06 %). Table 5.98 shows that the total overshoot of OCRT activities is equal to 10.18 gha (see also Table 5.88). The overshoot portion of each of the above EF categories (Other activities, curling, walking and golf) is calculated by the following equation:

Overshoot of the EF of each category = the percentage of the EF of activity \times total overshoot EF of OCRT activities (10.18gha)

For example:

Overshoot EF of golf = 7.3% \times 10.18(gha) = 0.74 gha (see Table 5.98).

Furthermore the overshoot energy use of each category is calculated as its overshoot EF \times 100 (global average carrying capacity) (Table 5.98).

As shown in Table 5.98, in comparison with the other categories, other activities have the largest overshoot energy at 835 GJ, followed by, curling (108GJ), golf (74) and walking (0.6 GJ).

5.11.3.2. OCRT Activities: GDP

This thesis proposes that the sum of the monies for vehicle-equipment hire (NZ\$975,119), road passenger transport (NZ\$446,136) and entertainment (\$61,925), as shown in Table 5.91, are used to represent the total GDP of OCRT visitor activities (NZ\$1,483,200) (Table 5.98). As the total number of OCRT annual visitor activities is 26,077 (see Table 5.82) then the GDP/visitor activity can be calculated as follows:

$\text{NZ\$1,483,200} \div 26,077 = \text{NZ\$56.88/visitor activity}$ (Table 5.98).

In Table 5.98 the GDP of each category is calculated as the number of visitor activities \times NZ\$57/visitor activity. Table 5.98 shows that for the total GDP of OCRT activities, the major share of NZ\$1,223,100 is the GDP of other visitors-activities, followed by NZ\$247,400 (curling), NZ\$ 8,700 (golf) and NZ\$4,000 walking.

5.11.3.3. OCRT Activities: GDPs

Table 5.98 contains the total cost to generate the overshoot energy use of each type of OCRT activity through using wind-solar systems. It shows that other activities have the largest cost at NZ\$16,533 and walking the minimum cost for generating overshoot energy in a sustainable way.

As shown in Table 5.98 the GDPs of the four categories of other activities, curling, golf and walking fall between NZ\$3,988 – NZ\$1,206,567. In addition the total GDPs of OCRT visitor activities is NZ\$1,463,052, equivalent to NZ\$1,483,200 – NZ\$20,149 (see Table 5.98).

Category	Number of visitor activities	EF ¹ (gha)	%	Overshoot EF(gha)	Overshoot energy use (GJ)	GDP (NZ\$)	Cost of overshoot energy ³	GDPs (NZ\$)
Golf	153	0.48	7.3	0.37	37	8,700	733	7,967
Curling	4,350	0.7	10.65	0.54	54	247,400	1,069	246,331
Walking	71	0.004	0.06	0.003	0.3	4,000	6	3,994
Other	21,503	5.39	82	4.17	417	1,223,100	8,257	1,214,843
Total	26,077	6.57	100	5.09 ²	509	1,483,200	10,065	1,473,135

1. See Figure 5.34 and Table 5.82
 2. See Table 5.89
 3. Numbers are rounded
 • Total GDP OCRT activities/visitor activity = 1,483,200 ÷ 26,077 = 56.88

Figure 5.45 illustrates three scenarios for the CF area of OCRT visitor activities and compares these areas with each other and the sustainable (ideal model) area of these activities (in the figure shown as the green area).

5.11.3.4. OCRT Visitor Activities: First Scenario

The present CF of OCRT visitor activities is shown as the first scenario in Figure 5. 45. In the first scenario the total number of visitor activities (26,077) comprises 21,503 visitors (other activities), 4,350 visitors (curling), 153 visitors (golf) and 71 visitors (walking) (see Table 5.99).

The total EF of OCRT visitor activities (EF 1) in the first scenario is 6.57 gha (see Table 5.98). In comparison with the EFs of other scenarios and the ideal model, the EF 1 is considered as 100% of the EF of visitor activities. As shown in Figure 5.45 and Table 5.98 in the first scenario GDPs₁ is 99.3% (NZ\$1,473,135) of the total GDP (NZ\$1,483,200) of OCRT visitor activities.

5.11.3.5. OCRT Visitor Activities: Second Scenario

The second scenario is proposed based on the assumption that the 153 visitors who play golf in the first scenario (see Table 5.98) choose walking as their activity instead of golf (see Table 5.99). In the second scenario, walking is considered as an example of other outdoor activities with same EF/visitor (0.00025-0.00006 gha/visitor- see Table 5.82).

Table 5.99: The CF of OCRT visitor activities- first and second scenarios

First scenario				Second scenario			
Category	NV ⁴	EF/visitor	EF 1	Category	NV	EF (gha/visitor)	EF2 (gha)
Golf	153	0.003 ¹	0.48	-	-	-	-
Curling	4,350	0.00016 ²	0.7	Curling	4,350	0.00016 ²	0.7
Walking	71	0.00005 ³	0.004	Walking	224	0.00005 ³	0.1
Other	21,503	0.00025	5.39	Other	21,503	0.00025	5.3
Total	26,077	-	6.57	Total	26,077	-	6.1

1. See Table 5.60
 2. See Table 5.54
 3. See Table 5.56
 4. NV: Number of visitor activities
 • (EF 1)-(EF2) = 6.57- 6.1= 0.47 gha

As shown in Table 5.99 and Figure 5.45, compared with the first scenario, in the second scenario EF2 is 92.8% (6.1gha) of EF 1(6.57gha) influenced by the 153 visitors who change their activity from golfing to walking. In addition, the overshoot portion of the EF of OCRT activities that in the first scenario is 5.09 gha (see Table 5.98) is reduced in the second to 4.62gha (5.09 – 0.47gha) for the same reason. As a result the overshoot energy use of OCRT activities in the second scenario is equal to 4.62gha × 100 (carrying capacity) = 462 GJ.

The total cost to generate the overshoot energy of OCRT visitor activities in the second scenario is equal to:

462 GJ (overshoot portion of energy use) × NZ\$19.8 (the cost to generate 1GJ energy through using wind-solar systems) = NZ\$9,148.

Since the total GDP of OCRT visitor activities is NZ\$1,483,200 (Table 5.98) the GDPs of the second scenario is equal to NZ\$1,483,200 (GDP) - NZ\$ NZ\$9,148 (the total cost of generating the overshoot energy of OCRT visitor activities in the second scenario) = NZ\$1,474,052 (GDPs2). As shown in Figure 5.45, GDPs2 is 99.4% of the total GDP of OCRT visitor activities and (I) GDPs2 is equal to GDPs2 – GDPs1 = 0.1% of GDP (NZ\$1,483,200) = NZ\$1,483.

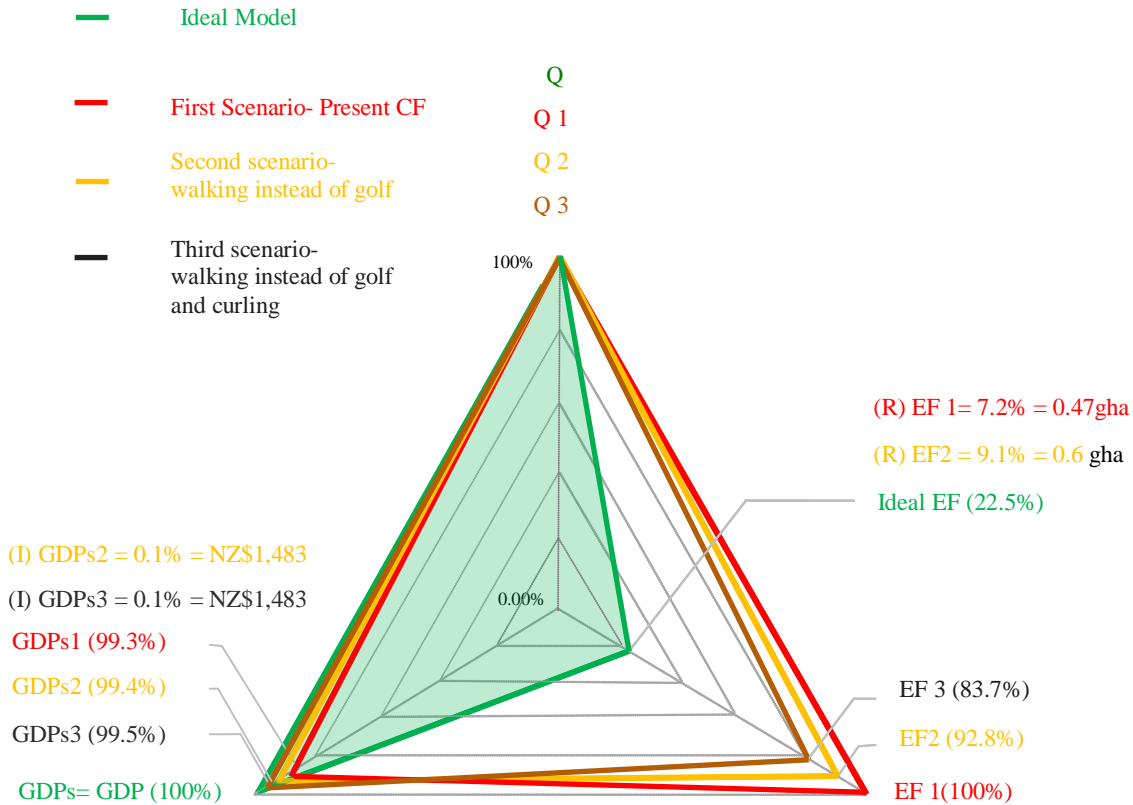


Figure 5.45: The CF of OCRT visitor activities

5.11.3.6. Comparison between Ideal Model and Second Scenario

As illustrated in Figure 5.45, in the ideal model (the green area in the figure) the environmentally sustainable EF for OCRT visitor activities is equal to:

6.57 gha total EF (see Table 5.98) – 5.09 gha overshoot portion of EF (see Table 5.98) = 1.48 gha.

In comparison with the EFs of other scenarios (EF 1 and EF2), the EF of the ideal model (1.48gha) is 22.53% of EF 1 and 24.26% of EF2 (6.1gha, see Table 5.99) Figure 5.45 indicates that for changing the EF of OCRT visitor activities in the second scenario to the ideal model (from EF2 to sustainable 1.48gha EF), 0.1% (NZ\$ 1,483) of the total GDP of OCRT activities (NZ\$1,483,200) must be spent to generate its overshoot portion of energy use.

5.11.3.7. OCRT Visitor Activities: Third Scenario

The third scenario is proposed based on the assumption that 153 visitors who play golf and 4,350 visitors who play curling in the first scenario (see Table 5.98) choose walking as their activity instead (see Table 5.100). In the third scenario, walking is considered as

an example of other outdoor activities with the EF/visitor of 0.00006gha/visitor - see Table 5.82.

First scenario				Third scenario			
Category	NV ⁴	EF/visitor	EF 1	Category	NV	EF (gha/visitor)	EF 3 (gha)
Golf	153	0.003 ¹	0.48	-	-	-	-
Curling	4,350	0.00016 ²	0.7	-	-	-	-
Walking	71	0.00006 ³	0.004	Walking	4,574	0.00006 ³	0.2
Other	21,503	0.00025	5.39	Other	21,503	0.00025	5.3
Total	26,077	-	6.57		26,077	-	5.5

1. See Table 5.58
 2. See Table 5.54
 3. See Table 5.56
 4. NV: Number of visitor activities

As shown in Table 5.100 and Figure 5.45 in comparison with the first scenario, in the third scenario the EF 3 is reduced by 16.28 % (1.07 gha) when compared with EF 1 because of the change in activities. In addition, the overshoot portion of the EF of OCRT activities that in the first scenario is 5.09 gha (see Table 5.98) in the third scenario is reduced to 4.02 gha (5.09gha – 1.07gha). As a result the overshoot energy use of OCRT activities in the third scenario is equal to 4.02gha × 100 (carrying capacity of land) = 402 GJ. In addition, the total cost to generate the overshoot energy use of OCRT visitor activities in the third scenario is equal to:

402 GJ (overshoot portion of energy use) × NZ\$19.8 (the cost to generate 1GJ energy through using wind-solar systems) = NZ\$7,959.

Since the total GDP of OCRT visitor activities is NZ\$1,483,200 (Table 5.98), the GDPs of the third scenario is equal to NZ\$1,483,200 (GDP) - NZ\$7,959 (the total cost to generate overshoot energy use of OCRT visitor activities in the third scenario) = NZ\$ 1,475,241 (GDPs 3). As shown in Figure 5.45, GDPs 3 is equal to 99.5% of the total GDP of OCRT visitor activities and (I) GDPs 3 is equal to:

$$\text{GDPs 3} - \text{GDPs 2} = 0.1\% \text{ of GDP (NZ\$1,483,200)} = \text{NZ\$1,483.}$$

5.11.3.8. Comparison between the Ideal Model and the Third Scenario

As illustrated in Figure 5.45, in the ideal model (the green area in the figure) the environmentally sustainable EF for OCRT visitor activities is 22.5% of EF 1(1.48 gha- see above discussion).

Figure 5.45 indicates that to change the EF of OCRT visitor activities in the third scenario (EF 3 to sustainable 1.48 gha EF), 0.1% (NZ\$1,483) of total GDP of OCRT activities (NZ\$1,483,200) must be spent to generate its overshoot portion of energy use.

Chapter 5: Summary

This chapter uses the comprehensive framework for the sustainable development of ecotourism and its architecture to evaluate the ecological, social and economic influences exerted by the OCRT on its host society. As Mahravan and Vale (2010) and O'Connor (2009) reveal, in New Zealand, the largest portions of the tourism EF are the four categories of transportation, food, accommodation services and tourism activities. Therefore this thesis uses these four categories as the main factors to be evaluated using the comprehensive framework and the model.

This chapter demonstrates that the 2011 EF of the OCRT is equivalent to 1,617 gha (0.138 gha/visitor) which derives from the integration of the calculated EFs of transportation, food, accommodation services and activities used by 11,788 OCRT visitors that year (see Table 5.84). As shown in Table 5.84 transportation has by far the largest footprint of 1,169 gha (72.2%) of the total EF, followed by 401.2 gha (24.8%) for food, 42.4 gha (2.6%) accommodation services and 6.6 gha (0.4%) visitor activities. The total EF of transportation can be further divided, giving 38.2% (617 gha) of total EF for international and 34% (552gha) for domestic transportation. This shows the importance of getting to a tourist destination in its overall environmental impact.

This chapter uses a comparative method by using different scenarios to investigate the current ecological, social and economic influences of the OCRT and its architecture on its host society. Using the scenarios allows this thesis to determine how far the OCRT is from its sustainable goal. For instance, this chapter demonstrates that the total overshoot EF of the OCRT is equivalent to 1,273 gha (Table 5, 95). This means the existing EF of the OCRT is 1,273 gha more than its sustainable EF of 388 gha (1,617- 1273) (Table 5.95).

This chapter indicates that 43.6% of OCRT total GDP must be spent to reduce its EF to its sustainable EF of (1,617- 1273) 388 gha (Table 5.95).

In response to the research question: “How do the priorities for the sustainable development of ecotourism and its products influence each other?” (2.6.1) this chapter determines that changing the social behaviours of the host society and visitors can influence their ecological and economic footprints. For example, consuming organic food instead of conventional food, and using refurbished buildings as accommodation instead of constructing new buildings, not only contribute to conserving cultural identity in the host society, but also contribute to reducing their ecological footprint and consequently increasing their economic footprint.

Furthermore in response to the research question: “What are the main environmental, cultural and economic characteristics of the activities and products proposed for the sustainable development process of ecotourism?” (2.6.1), Chapter 5 indicates that the products and activities which simultaneously contribute to the cultural, environmental and economic development of the host society of an ecotourism project can be considered as having the sustainable cultural footprint as their main characteristic.

This chapter uses the framework and the model through a comparative method to show how the environmental, social and economic influences of ecotourism products and activities can be evaluated as being sustainable. Using the CF model and its results can thus be seen as the answer to question 2.6.1.7.

In the next chapter the comprehensive framework and the model will be used to explore and compare the cultural footprints of ecotourism and its architecture in two different host societies (Naseby and Cromwell) as the second and third case studies.

Chapter 6: Second and Third Case Studies: Naseby and Cromwell –OCRT, New Zealand

This chapter uses the proposed comprehensive framework for the sustainable development of ecotourism and its architecture at the scale of the site and individual building. The results provide further answers to research questions at these different scales. In addition this chapter shows how the framework and model can be used to compare different ecotourism host destinations as being sustainable. To achieve this goal, two case studies of Naseby and Cromwell, as the host destinations of soft ecotourism (OCRT) with different environmental, cultural, economic heritage and capitals, are used. Also Naseby and Cromwell are shown to be two host destinations with different attractions that arise from their particular social ecological characteristics. The outcome of this chapter will demonstrate the influences exerted by ecotourism and its architecture on the two case studies from the viewpoint of sustainable development.

6.1. Case Study 2: Naseby

6.1.1. Introduction

This thesis is based on Naseby as a host destination of OCRT visitors with a rich environmental and cultural heritage and associated capitals. As explained in Chapter 3 the main reasons for choosing Naseby as a case study are its use of refurbished buildings as accommodation services, existence of the curling club visited by 4,350 OCRT visitors in 2011, and the variety of products and activities offered to visitors at this place (see 3.3.2.2).

This research attempts to explore the ecological, cultural and economic footprints of the OCRT as a soft ecotourism project at this destination, and their interaction with each other. This exploration is conducted through using the proposed holistic framework for the development of ecotourism and its architecture as proposed earlier in this thesis.

This section aims to investigate the influences exerted by ecotourism on the socio-cultural behaviours of visitors and host communities that in turn could change their environmental and economic footprint to being sustainable.

The investigation of the influences of the OCRT and its architecture on Naseby is conducted through measurement of the quantity of the cultural products and activities produced and consumed (numbers of visitors who participate in these activities), and calculation of their ecological and economic footprints. The results are compared with the quantities of these factors in a sustainable scenario, as proposed for the development of ecotourism and its products.

6.1.2: Background to Naseby

Naseby is a town located at elevation of 627m, 45° S and 170°E, about 15 kilometres from Ranfurly in Central Otago, New Zealand (Figure 6.1). Naseby is set in a valley surrounded by hills and 25 square kilometres of forest (Figure 6.2). As pointed out by Sorrel (1999-cited in Naseby Vision, 2012: 2), in more recent times, Naseby has become an important forestry centre with the initial forest having been planted as early as 1900. Naseby Community Program (NCP) (2010: 8) introduces the landscape and heritage aspects of Naseby as fundamental factors that contribute to the perception of this area as a special place.

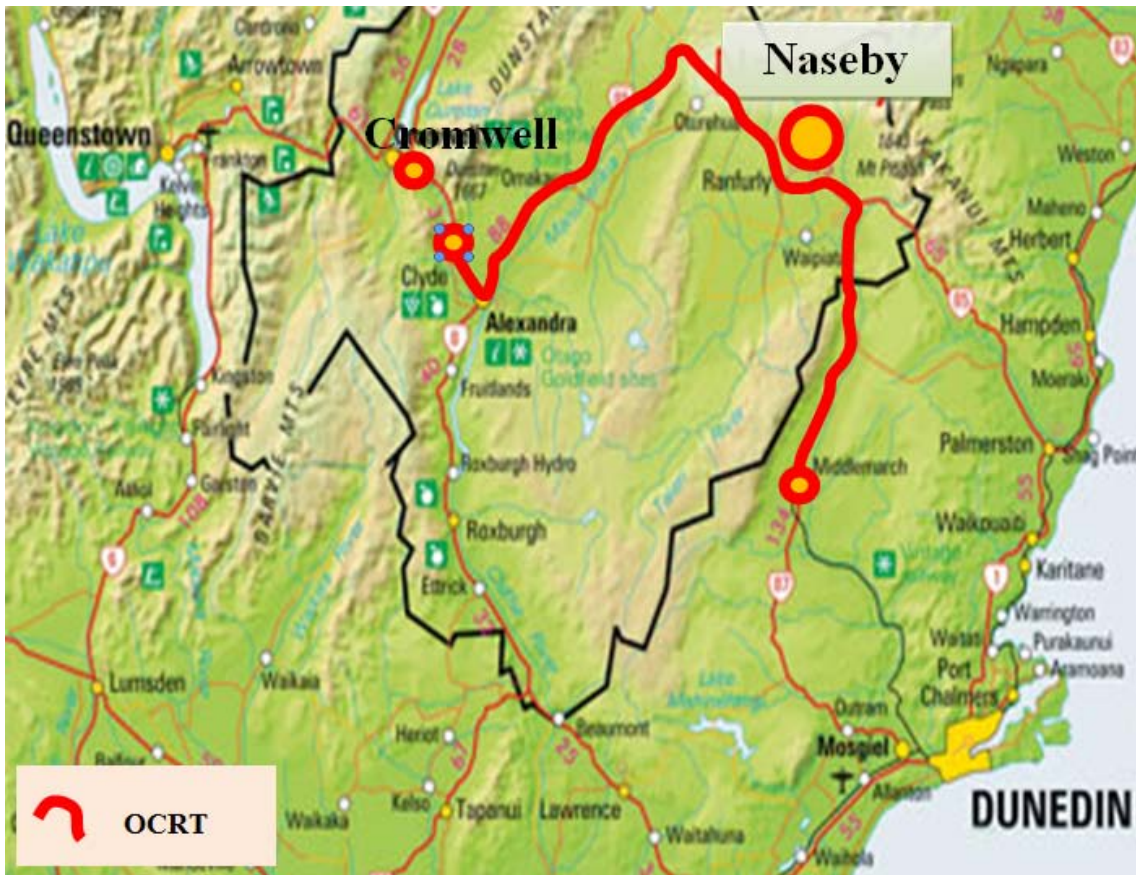


Figure 6.1: Naseby-Central Otago- New Zealand

http://www.no1guide.co.nz/images/map/Map_of_Central_Otago.jpg viewed August 2012



Figure 6.2: A view of Naseby

http://www.odt.co.nz/files/story/2010/04/naseby_township_nestled_close_to_the_naseby_fores_1659772314.JPG viewed August 2012

NCP (2010:7) reveals that Naseby came into existence in 1863 when gold was discovered close to where it stands now and how Naseby was moved to get at the rich ground beneath it. As noted in the Ancient Briton Hotel, Naseby website (2011:1) the town's first buildings were of a wooden frame with a calico (cloth) construction and twenty canvas shops lined each side of a muddy main street. The Ancient Briton Hotel (built in 1863) was the first hotel in Naseby (see Appendix 5 and Figures 6.3, 6.4 and 6.5).

When the town grew, the buildings become more permanent with timber frame construction and with walls and roof covered with corrugated iron sheets. Some buildings were made of flat schist and glacial moraine stone with a corrugated iron roof, and others were constructed from adobe (sun dried mud brick) (see <http://www.ancient-briton.co.nz>). As shown in Appendix 5, many of the original miners' cottages and other historic buildings and sites still remain in use today in Naseby. NCP (2010:36-37) introduces a list of 23 such buildings, places, sites and objects that are registered as part of the natural and cultural heritage of New Zealand.



Figure 6.3: Ancient Briton Hotel, Naseby, Built in 1863
<http://www.otagorailtrail.co.nz/images/stories/ancientbritonold.jpg> viewed August 2012



Figure 6.4: Ancient Briton Hotel, location in Naseby
Google map viewed 2012



Figure 6.5: Ancient Briton Hotel, Naseby- 2012
http://www.historic.org.nz/corporate/registersearch/Register/data/3214a_lg.jpg viewed August 2012

Tourism is a major component of the local economy at Naseby, as for other places located along the OCRT. As explained by the NCP (2010:19) many people visit Naseby for recreation and sport. The former includes forest walks, heritage, township and gold-field remnants and the ambience of peace and quiet, while the latter include the more active pursuits of curling, ice skating, luge, and cycling/mountain biking . The growth of the OCRT is reflected in an increased number of visitors passing through Naseby. The town has traditionally been a holiday spot at regional scale for domestic visitors; especially those coming to Naseby for curling and mountain biking at this place (see Figures 6.6, 6.7 and 6.8).



Figure 6.6: Ladies' curling rink of the Mount Ida Curling Club, Naseby, built in 1878
1. [http://nzetc.victoria.ac.nz/etexts/Cyc04Cycl/Cyc04Cycl0606a\(h280\).jpg](http://nzetc.victoria.ac.nz/etexts/Cyc04Cycl/Cyc04Cycl0606a(h280).jpg) viewed August 2012
2. <http://www.ancientbriton.co.nz/curling.htm> viewed August 2012



Figure 6.7: Naseby’s indoor curling rink
http://4.bp.blogspot.com/_HwUk2QL7wc/TDrrWj5dZpI/AAAAAAAAABZc/Y9ytVNHfe0/s400/curling_wide.jpg viewed August 2012



Figure 6.8: Naseby outdoor curling competition (2010)
http://www.odt.co.nz/files/story/2010/07/competition_for_the_baxter_cup_was_hot_yesterday_d_4c399d2244.JPG viewed August 2012

Moreover as NCP (2010:28) points out, Naseby has access to the adjacent forest including a 500ha recreation area of mostly exotic trees, 50km of walking/cycling tracks (see Figures 6.9 and 6.10) , picnic areas, a children’s playground, historic gold mining sites and two dams for fishing and swimming. Due to Naseby’s attractions, such as ambience, heritage and recreation, this place is offered by the OCRT to its visitors as a distinctive destination along the trail to stay for relaxing times, recreational activities, enjoying scenery and study of a part of New Zealand’s history.



Figure 6.9: Naseby – cycling track
<http://www.maniototo.co.nz/wpcontent/uploads/2009/06/Biking-outlook-from-rear-landscape-comp.jpg> viewed August 2012



Figure 6.10: Naseby - walking track
<http://www.lugenz.com/photos/Theres-so-much-to-do-in-Naseby/Walk%20the%20forest.jpg> viewed August 2012

However, as NCP (2010:19) points out, an important question is how to best take advantage of the tourism market without negating the natural and cultural values of Naseby itself.

6.1.3: Visitors to Naseby

In this thesis Naseby’s visitors are classified into the two groups of international and domestic visitors. This section (6.1.3) presents information related to each group, including the number of visitors, visitor nights and their home places.

6.1.3.1: Visitor Numbers

As shown in Table 5.49 (Chapter 5- 5.7.4) in 2011 of 11,788 OCRT visitors 36.9% (4,350) played curling at Naseby and 2.5% (295) came to Naseby for mountain biking. In the absence of any other data, this study assumes these 4,645 visitors are the total number of visitors who stopped at Naseby in 2011, as shown in Table 6.1. Moreover, as shown in Figure 5.7 (Chapter 5) in 2011 the average stay of OCRT visitors is 3.6 nights. So the total visitor nights at Naseby based on its 4,645 visitors and 3.6 average visitor nights is assumed here to be 16,722 (4,645 visitors × 3.6 visitor nights) (Table 6.1).

Table 6.1: Naseby visitors - based on CODC survey (2011)

Total numbers of OCRT visitors	% of OCRT visitors who play curling at Naseby	Number OCRT visitors who play curling at Naseby	% OCRT visitors who go mountain biking at Naseby	Number OCRT visitors who go mountain biking at Naseby	Total Naseby visitors	Average visitor nights	Total visitor nights
11,788	36.9	4,350	2.5	295	4,645	3.6	16,722

6.1.3.2: Visitors’ Home Place

As illustrated in Figure 5.13 (Chapter 5: 5.3.3) 78% of the total 11,788 OCRT visitors are domestic and 22% are international. This thesis uses these proportions to calculate the number of Naseby international and domestic visitors as shown in Table 6.2.

Table 6.2: Naseby international and domestic visitors (2011)

Domestic visitors		International visitors	
Number of visitors	% of total number of visitors	Number of visitors	% of total number of visitors
3,623	78	1,022	22
• Naseby total visitors (2011) = 4,645 (see Table 6.1)			

a. International Visitors

This thesis uses the percentage of OCRT international visitors cited in Table 5.1 (Chapter 5: section 5.3.3.1) and the right hand column in Table 6.3 as a base to calculate the number of international visitors to Naseby in 2011. As presented in Table 6.3, of the 1,022 international visitors, the majority of 436 visitors came from Europe (excluding the UK) followed by 336 (32.9%) Australia and 129 (12.6%) UK. The numbers of other international visitors including those from North America, Middle East and Africa are in the range of 14 (1.4%) – 92 (9%) (Table 6.3).

Home place	NV ¹	%
Europe	436	42.7
Australia	336	32.9
UK	129	12.6
North America	92	9
Middle East	14	1.4
South Africa	14	1.4
Total	1,021~ 1,022 ²	100

1. NV: Number of Visitors.
 2. NVs are rounded

- Total visitor numbers (2011) = 4,645 (See Table 6.2)
- Percentage of International visitors (2011) = 22% (See Table 6.2)
- Total number of Naseby international visitors= 1,022 (See Table 6.2)

b. Domestic Visitors

This thesis uses the percentages of OCRT domestic visitors cited in Table 5.3 (Chapter 5: section 5.3.3.2) and Table 6.4 (right hand column) to calculate the number of domestic visitors in 2011. As shown in Table 6.4, of Naseby's 3,623 domestic visitors, the majority of 1,297 (35.8%) are from upper NI, followed by 824 (22.75%) central SI, 768 (21.2%) upper SI, 540 (14.9%) lower NI, and 194 (5.35%) lower SI.

Region/ city	Number of visitors	%
Upper NI	1,297	35.8
Lower NI	540	14.9
Upper SI	768	21.2
Central SI (Otago)	824	22.75
Lower SI	194	5.35
Total	3,623	100

6.1.4. Transportation

This section explores the types of international and domestic transportation used by Naseby's visitors and calculates their EFs. The total EF of Naseby transportation is calculated through integration of the EFs of international and domestic visitors.

6.1.4.1. International Transportation

a. Types of International Transportation Used

Since travelling from overseas to New Zealand by car, bus and train is not possible because of its geographical location and using a ship takes a long time, all international travel is here assumed to be by air.

b. International Tourism-kilometres (T-km)

Table 6.5 shows that 1,022 Naseby visitors (22%) are international tourists and the total distance between their home places and Auckland's international airport is equivalent to 12,616,876 (T-km). International distances are calculated as a one way trip because the assumption is made here that their ecological footprint is related to where the plane is refueled and hence is divided between New Zealand and the home country. Because international tourists have to travel from Auckland to Dunedin and back, this part of the journey is a domestic flight and is equivalent to 2,201,246 T-km which is shown in Table 6.5 as air domestic international visitors.

Home place	Assumed city of origin (central in country of origin)	Distance between central cities and Auckland (km).	Visitors		Total international T-km	Auckland to Dunedin (km, return)	Air domestic international visitors T-km from Auckland to Dunedin (return)
			No	%			
Australia	Sydney and Melbourne	2,512	336	32.9	844,032	2,156	724,416
Europe	Frankfurt	18,180	436	42.7	7,926,480	2,156	940,016
UK	London	18,334	129	12.6	2,365,086	2,156	278,124
North America	Montana Billings	11,950	92	9	1,099,400	2,156	198,352
Middle East	Tehran	15,005	14	1.4	210,070	2,156	30,184
South Africa	Pretoria	12,272	14	1.4	171,808	2,156	30,154
Total	-	-	1,022	100	12,616,876	-	2,201,246

6.1.4.2. Types of Domestic Transportation

The types and percentages of transport used for holidays in New Zealand as cited in Chapter 5 and shown in Table 5.5 (Matthews, 2009:13) are used as a pattern for transport used by domestic visitors to access Naseby.

a. Domestic Tourism Kilometres (T-km)

This study uses Auckland as the central city for the upper NI and, respectively, Wellington (lower NI), Nelson/Marlborough (upper SI), Otago (central SI) and Southland (lower SI), to calculate the distances between domestic visitors' home place and Naseby (Table 6.6). In addition, to measure the distance between home places of visitors who came from the upper SI, the average distance between Nelson and Naseby and Marlborough and Naseby is used (Table 6.6).

Naseby's visitors who travel by car/van from the upper NI (Auckland) and lower NI (Wellington) (grey areas in Table 6.6) need to use the ferry to cross to the South Island. Distances between these places and Middlemarch are separated into three parts; home to Wellington (except Wellington); Wellington to Picton by ferry; and Picton to Middlemarch (Table 6.6).

Table 6.6: OCRT- domestic T-km

Region	Central city	Distance to Middlemarch (km-return)				Number of Visitors	Domestic T-km
		Auckland to Wellington	Wellington to Picton	Picton to Middlemarch	Total		
Upper NI	Auckland	1,318	204	1,480	3,002	1,297	3,893,594
Lower NI	Wellington	-	204	1,480	1,684	540	909,360
Upper SI ¹	Nelson/Marlborough	1,686 ¹			1,686	768	1,294,848
Central SI	Otago	125 ²			125	824	103,000
Lower SI	Invercargill, Southland	488			488	194	94,672
Total	-	-			-	-	6,295,474

1. Distance between upper SI and Middlemarch is calculated as the average of distances between Nelson and Middlemarch and Marlborough and Middlemarch.

2. Average distance between central Otago cities and OCRT.

According to Matthews (2009:13), in New Zealand 1% of people going on holiday are pedestrians but in this study these have been ignored. The remaining 3% of visitors is assumed to be domestic air travel in Table 6.7. In addition, the ferry T-km of 377,728

(Table 6.7) is subtracted from the total car/van T-km of 5,980,700 to give the road T-km.

Type of Transport	Car/van driver/passenger (%)	Bus (%)	Car-Ferry (%)	Air domestic (%)
percent	89	2	6	3
Type of Transport	Car/van driver/passenger (km)	Bus (km)	Ferry (km)	Air domestic (km)
Tourist-km	5,602,972	125,909	377,728	188,864
Total domestic T-km	6,295,474			

• Numbers are rounded

6.1.4.3. The Ecological Footprint (EF) of Naseby Transportation

Table 6.8 shows that total transportation energy used related to Naseby (2011) is equivalent to 45,963,318 MJ (45,963.318GJ). The global average land energy conversion capacity is equivalent to 100 GJ/gha. As demonstrated in Table 6.8 the total EF of Naseby transportation is equivalent to 45,963.318 GJ/ 100 GJ/gha= 459.6 gha.

Transport Mode	Tourist-km	Energy use MJ/passenger-km	Total energy use per yr by OCRT visitors (MJ)
Air International	12,616,876	1.25 (Boeing 747)	15,771,095
Air domestic (International visitors from Auckland to Dunedin)	2,201,246	3.88	8,540,834
Air domestic	188,864	3.88	732,792
Car/van driver and passenger	5,602,972	3.1 (average)	17369213
Bus	125,909	1.01	127,168
Car-ferry	377,728	9.06	3422216
Total		Reference: Vale & Vale, 2009.	45,963,318
EF for all types of transportation used by Naseby visitors			459.6 gha ¹

1. Total EF of Naseby transportation includes: 243.1 gha (EF of international transportation) + 216.5 gha (EF of domestic transportation)

Table 6.8 shows the total energy use of Naseby transportation (45,963.318GJ) that includes 24,311.929 GJ for air international and air domestic (international visitors from Auckland to Dunedin) and 21,651.389 GJ for domestic transportations. As a result, the total EF of Naseby transportation (459.6gha) is comprised of 52.9% (243.1 gha) international and 47.1% (216.5 gha) domestic transportation.

6.1.5. Food

As shown in Table 6.1, 4,645 visitors came to Naseby in 2011 and the mean number of nights that tourists stayed is assumed to be 3.6. Thus the total visitor nights for tourists coming to Naseby/yr are 16,722 visitor nights. Due to the lack of local information, the food consumption data presented by Collins et al (2005) are used to calculate the EF of food for Naseby's visitors.

This thesis uses two scenarios to calculate the EF of food consumed by Naseby visitors in 2011. In the first scenario, the EF of food is calculated based on the assumption that 100% of food consumed is conventional food eaten out. In the second scenario, the total food eaten by Naseby visitors is separated into the two areas of local (home prepared) food (11.8% of total consumed food) and conventional food (88.2% of total consumed food).

Comparison between the results of the two scenarios will indicate the influence exerted by the use of home prepared food (as a cultural product) on the EF and the economic footprint (ECF) of the OCRT.

6.1.5.1. The EF of Naseby Food- First scenario

In the first scenario, the total amount of food eaten by Naseby visitors has been assumed to have a footprint equivalent to that of food consumed outside the home by Cardiff residents. This totals 67.04 kg per resident/yr (Collins et al, 2005:25) with a footprint of 0.429gha/resident (Collins et al, 2005:32). This means 1kg of food eaten out has an EF of $0.429/67.04 \text{ gha/kg}=0.006 \text{ gha/kg}$. The average amount of food eaten by a Cardiff resident each day is 1.85 kg, and this value has been used for visitors to Naseby. The results are shown in Table 6.9. The EF of tourist food is equivalent to $1.85 \times 0.006 = 0.01 \text{ gha/visitor night}$ (Table 6.9). The total EF of food consumed by Naseby's visitors is equivalent to $16,722 \times 0.01 = 167.22 \text{ gha}$ and the EF of food consumed by Naseby's visitors/visitor is equivalent to $167.22/4,645 = 0.036 \text{ gha}$ (Table 6.9).

Table 6.9: EF of food consumed by Naseby visitors (2011)

Item	Data	Reference
Naseby visitor numbers (2011)	4,645 (See Table 6.2)	
Average visitor nights/ visitor	3.6	
Total visitor night	16,722	
EF of food eaten out gha/cap	0.429	Collins et al , 2005:32
EF of tourist food gha/visitor night	0.01	
Total EF of food consumed by Naseby visitors (gha)	167.22 (gha)	
EF of food consumed by Naseby visitors/visitor(gha)	0.036 (gha/visitor)	

6.1.5.2. The EF of Naseby Food- Second Scenario

This thesis explores the local products (such as food, beverages and wine) offered to Naseby visitors by 98 separate accommodation services with 611 available bed spaces. (Appendix 5- Rows 75-90, Naseby). The information related to Naseby products arising from Appendix 5, are summarised and set out in Table 6.10.

Table 6.10 demonstrates that in 2011, of the 98 separate Naseby accommodation services with 611 bed spaces that offered local produce, 10.2% (10) with 72 bed spaces offered home baking and local food and beverages to their visitors and 2% (2) with 27 bed spaces were offering locally produced wine. As shown in Figure 5.3, the OCRT average visitor nights is 3.6 visitor nights. Likewise, the total Naseby visitors are 4,645 visitors. Thus the total visitor nights of Naseby is (3.6 visitor nights \times 4,645 visitors) 16,722. Since the total Naseby bed spaces are 611, the average visitor nights per bed space is equivalent to 16,722 (visitor nights) \div 611 (bed spaces) = 27.4 (visitor nights/bed space). Consequently as shown in Table 6.10 the total visitor nights that Naseby visitors consume local food is equivalent to 72 \times 27.5 = 1,973 visitor nights or 11.8% of the total 16,722 Naseby visitor nights (Table 6.10).

Table 6.10. Naseby- local produce (summary)

Produce	F	%	% of 98 accommodations services	Bed spaces	Visitor nights ¹
Local food and beverage	10	83	10.2	72	1,973 ²
Wine	2	17	2	27	740
Total	12	100	12.2		

1. Average visitor nights/ bed spaces= 16,722 (total visitor nights)/611 (total numbers of bed spaces) = 27.4
2. 72 (bed spaces) \times 27.4 (average visitor nights per bed space) = 1,973 visitor nights

This thesis uses the EFs of home cooked and conventional foods (per capita, per kg and per visitor night) as discussed in Chapter 5 (section.5.5.2 and Tables 5.11 and 5.12) to

calculate the EFs of home cooked and conventional foods consumed by Naseby’s visitors as cited in the following Table

Table 6.11 indicates that the EF of local food consumed by Naseby visitors in 2011 is equivalent to (1,973 visitor nights × 0.0068 gha) 13.4 gha. As the total Naseby visitor nights is 16,722 (see Table 6.1) and total visitor nights that visitors consume home cooked food is 1,973, consequently the total visitor nights that Naseby’s visitors consume conventional food is equivalent to 16,722 – 1,973= 14,749 visitor nights (see Table 6.11). Moreover the EF of consumed conventional food by Naseby visitors in 2011 is equivalent to 14,749 visitor nights × 0.01 (EF of tourist conventional food- gha/visitor night) = 147.5gha (Table 6.11). The total EF of consumed food in the second scenario (present circumstance) including EFs of conventional and home prepared foods is 13.4 gha + 147.5 gha = 160.9 gha (Table 6.11).

Home cooked and local food	EF	Conventional food	EF
EF of local food gha/cap	0.254	EF of 1 kg conventional food eaten out (gha/cap)	0.429
EF of 1 kg local food gha/kg	0.0037	EF of tourist food (gha/visitor night)	0.01
EF of local food gha/ visitor night	0.0068		
EF of local food of 1,973 visitor nights (gha)	13.4	Total EF of conventional food consumed by Naseby visitors/14,749 ¹ visitor nights (gha)	147.5
Total EF of home prepared and conventional foods (gha)			160.9

1. 16,722 (total visitor nights) – 1,973 (visitor nights that tourists consume local food) = 14,749

6.1.5.3. Environmental Effects of Using Local Food

Comparing the results of the two scenarios shows that producing 11.8% (3,650kg) of food locally reduces the total EF of food by 6.32 gha (3.8% of 167.22 gha) (Table 6.12).

	100% (30,936 kg) conventional eaten out food	88.2 % (27,286 kg) conventional eaten out food and 11.8 % (3,650 kg) home prepared (organic) food
Naseby EF of food	167.22	160.9
Reduction in EF of food consumed by OCRT visitors (gha)	6.32	

6.1.6. Naseby Accommodation Services

6.1.6.1. Types of Accommodation Services

This thesis categorises the 98 Naseby accommodation services into the four categories of self-contained (SC), bed and breakfast (B&B), hotel, and camping based on the information collected through using the official web site of the OCRT and 15 related websites for Naseby accommodation services (Appendix 5 and 6-Rows:75-90). Table 6.13 summarises parts of Appendix 5 that address available bed spaces by types of Naseby accommodation service.

As shown in Table 6.13 and Figure 6.11, in 2011, of the 98 separate Naseby accommodation services the majority of 73.5% are camping sites followed by 18.4% SCs, 6.1% B&Bs, and 2% hotels, as shown in Table 6.13 and Figure 6.11. This table also shows how the percentages change when bed space numbers are considered by accommodation type. Camping still has the highest percentage of bed spaces followed by SC, as before, but the relative positions of hotels and B&B have changed.

Type	Number of type	%	Available bed spaces	%
SC	18	18.4	93	15.2
B&B	6	6.1	28	4.6
Hotel	2	2	58	9.5
Camping	72	73.5	432	70.7
Total	98	100	611	

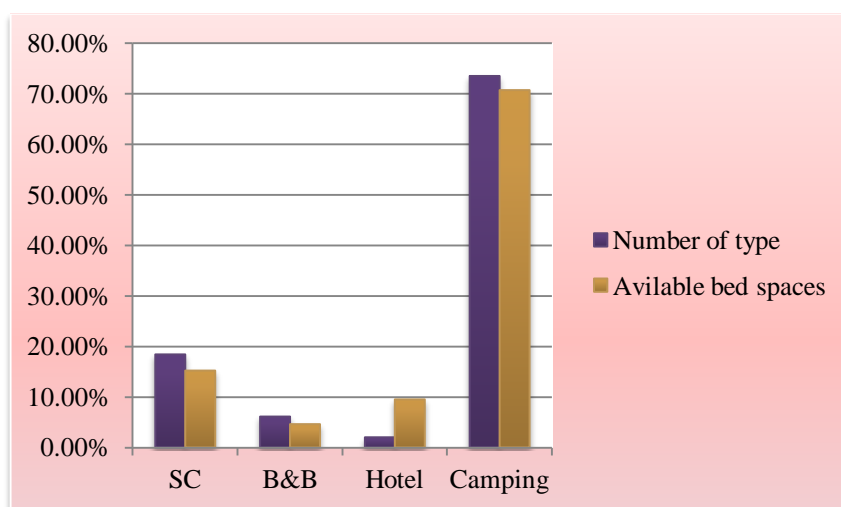


Figure 6.11: Naseby- percentage of type and available bed spaces by types of accommodation services (2011)

6.1.6.2. Quality of Accommodation Services

According to the information shown in Appendix 5 and summarised in Table 6.14 this study qualitatively classifies Naseby’s accommodation services into the two types of new (NB) and refurbished (RB) buildings. In Naseby, RB accommodation services cover a range of historical and restored buildings with different original functions, but currently all of them are used as accommodation services. Likewise new buildings here are those that have been constructed after the establishment of the OCRT and are used as accommodation services.

Table 6.14: Naseby- Accommodation services, refurbished (RB) and new buildings (NB) used as accommodation services and their capacity

Type	TNA	% ¹	RB	% ¹	NB	%	Capacity			
							RB		NB	
							C	% ²	C	% ²
SC	18	18.4	3	3.1	15	15.3	10	1.6	83	13.6
B&B	6	6.1	1	1	5	5.1	5	0.8	23	3.8
Hotel	2	2	2	2	-	-	58	9.5	-	-
Camping	72	73.5	-	-	72	73.5	-	-	432	70.7
Total	98	100	6	6.1	92	93.9	73	11.9	538	88.1

1. The percentages of the number of renewed/historic and new constructed buildings are calculated based on total number of Naseby accommodation services (n=98).

2. The percentages of the capacities of renewed/historic and new constructed buildings are calculated based on total capacity of Naseby accommodation services (611 bed spaces).

- TNA= Total Number of Accommodation Services Types.
- RB= Refurbished Buildings used as accommodation services.
- NB= New Buildings used as accommodation services.
- C=Capacity

Table 6.14 and Figure 6.12 show that, of 98 Naseby accommodation services, 6.1 % (6) including 3.1% (3) SC, 1% (1) B&B and 2% (2) hotels are RB and 93.9 % including 15.3% (15) SCs, 5.1% (5) B&Bs and 73.5% (72) camping sites are NB.

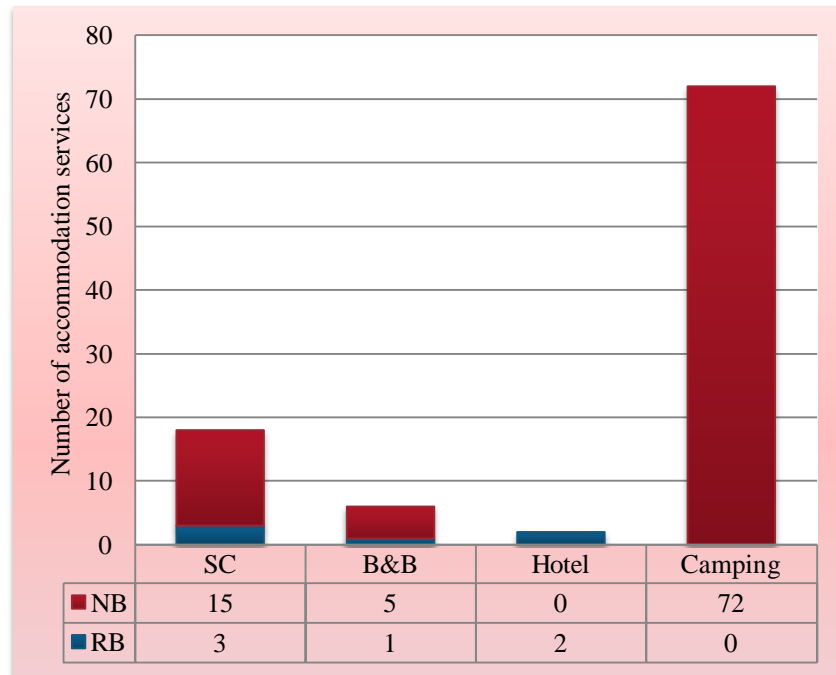


Figure 6.12: Naseby- Refurbished (RB) and new (NB) accommodation services (2011)

Table 6.14 and Figure 6.13 determine that 11.9% of 611 available bed spaces including 1.6% (10) SCs, 0.8% (5) B&Bs and (58) 9.5% hotels are RB and 88.1% including 13.6% (83) SCs, 3.8% (23) B&Bs and 70.7% (432) camping sites are NB.

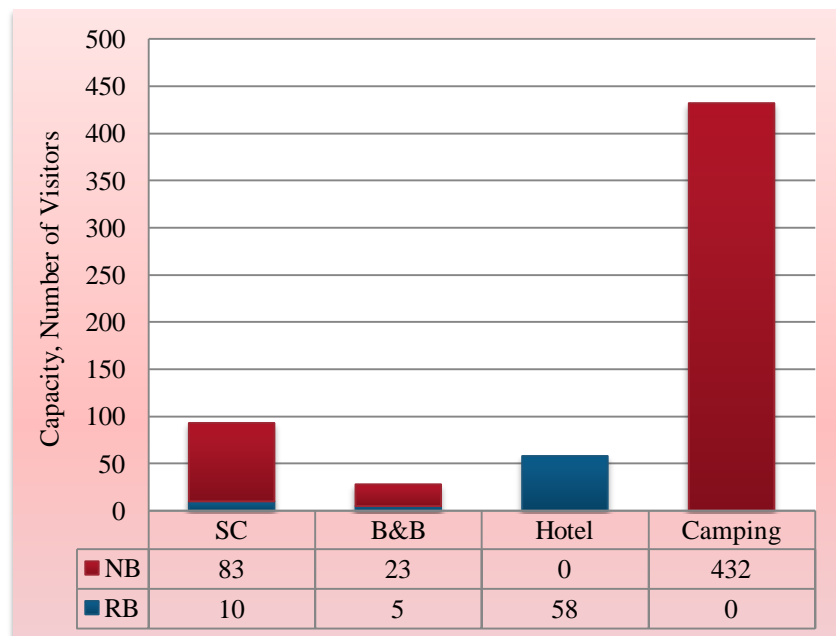


Figure 6.13: Naseby- capacity of RB and NB accommodation services 2011 (total bed spaces= 611)

6.1.6.3. Materials Used for Accommodation Services

In this thesis the materials used for Naseby accommodation services are explored through using relevant information published in the 15 official websites of Naseby OCRT accommodation services (Appendix 5). The main materials used for constructing each type of accommodation service in 2011 (except camping sites) are set out in Appendix 5 and the summarised information is shown in Table 6.15, and Figures 6.14 and 6.15.

Table 6. 15: Naseby - materials used by type of accommodation (2011)

material(s)	No of bed spaces	%	Type of accommodation service					
			SC		B&B		Hotel	
			No	C	No	C	No	C
Timber	114	63.7	16	73	11	23	1	18
Mud brick	8	4.5	1	8				
Mixed brick ² and timber	45	25.1	-	-	1	5	1	40
Mixed timber, aluminium facade and wood joinery	12	6.7	1	12	-	-	-	-
Total bed spaces	179	100	18	93	12	28	2	58

1. Brick includes: red brick, clay brick and brick.
 • No = Number of accommodation services.
 • C= Capacity (number of bed spaces).

This thesis classifies the types of materials used into the four types of timber, mud brick, mixed brick and timber and mixed timber, aluminium facade and wood joinery (Table 6.15). As shown in this Table and Figure 6.14, of the total 179 Naseby accommodation bed spaces the majority of 114 bed spaces (63.7%) are timber followed by 45 mixed brick and timber (25.1%), 12 mixed timber, aluminium facade and wood joinery (6.7%) and 8 mud brick (4.5%).

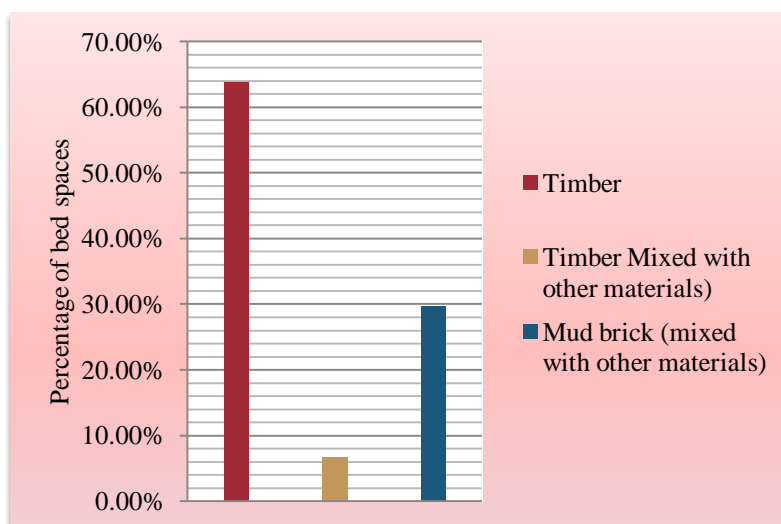


Figure 6.14: Naseby – bed spaces by type of materials used (2011)

Table 6.15 and Figure 6.15 indicate that the 93 Naseby SC bed spaces comprise 73 (79%) that use timber as the main construction material followed by 12 (12.9%) mixed timber with other materials and 8 (8.6%) mud brick. Furthermore, of 28 Naseby B&B bed spaces the majority of 23 (82.1%) use timber as the main material for construction and 5 (17.9 %) use mud brick and timber. Similarly 40 (69%) out of 58 Naseby hotel bed spaces are mixed mud brick and 18 (31%) are timber as the main construction material.

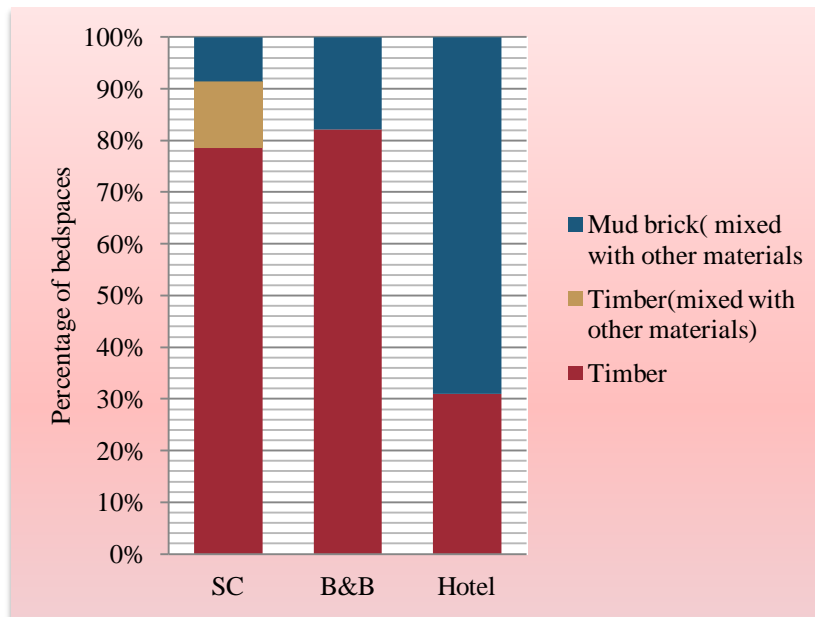


Figure 6.15: Naseby- used materials by types of accommodation services (2011)

6.1.6.4. Accommodation Energy Sources, Facilities and Spaces

As shown in Appendix 5 (Rows 75- 90) this thesis explores the energy sources and facilities used in 98 Naseby accommodation services through using related information published in these accommodation websites. This thesis classifies this information by types of Naseby’s accommodation services as shown in Appendix 5 and summarised in Appendices 22-27. In this thesis, all heating systems (electricity, log, gas and solar) are explored by type of accommodation service. Of possible facilities and equipment used, TV, and internet are chosen to be explored, as using these facilities can be considered as indicator for a modernised lifestyle (Appendices 22-27). Since using open air areas has been introduced in this thesis as one of the environmental and cultural indicators for evaluating architecture as being sustainable, verandas, balconies and outdoor seating are also investigated. The following part presents this data classified by type of accommodation service, shown in Appendix 16 which summarise Appendices 9-15.

a. SC Energy Sources, Facilities and Open Air Spaces (2011)

Figure 6.16 and Appendices 22 and 23 demonstrate that, of 93 SC bed spaces 54 (58.1%), including 48 (51.6%) NB and 6 (6.5%) RB use electricity for heating. In addition, 23 (24.7%) SC bed spaces including 6 (6.5%) RB and 17 (18.3%) NB use logs, and 30 (32.3%) including 4 (4.3%) RB and 26 (28%) NB use gas for heating (Figure 6.16 and Appendix 23).

Likewise, of 93 Naseby SC bed spaces, 49 (52.7%) use a solar system for heating (water-heating) (Figure 6.16 and Appendix 23). As illustrated in Figure 6.16 and shown in Appendix 23, 35 (37.5%) of 93 Naseby SC bed spaces including 6 (6.5%) RB and 29 (31%) NB bed spaces have a shared TV. In addition, 79 (85%) of Naseby SC bed spaces including 10 (10.8%) RB and 69 (74.2%) NB have access to the Internet (Figure 6.16 and Appendix 23). Furthermore, 6 (6.5%) Naseby SC bed spaces (NB) can access a shared V/B and 12 (12.9%) NB SC bed spaces have a private V/B (Figure 6.16 and Appendix 23).

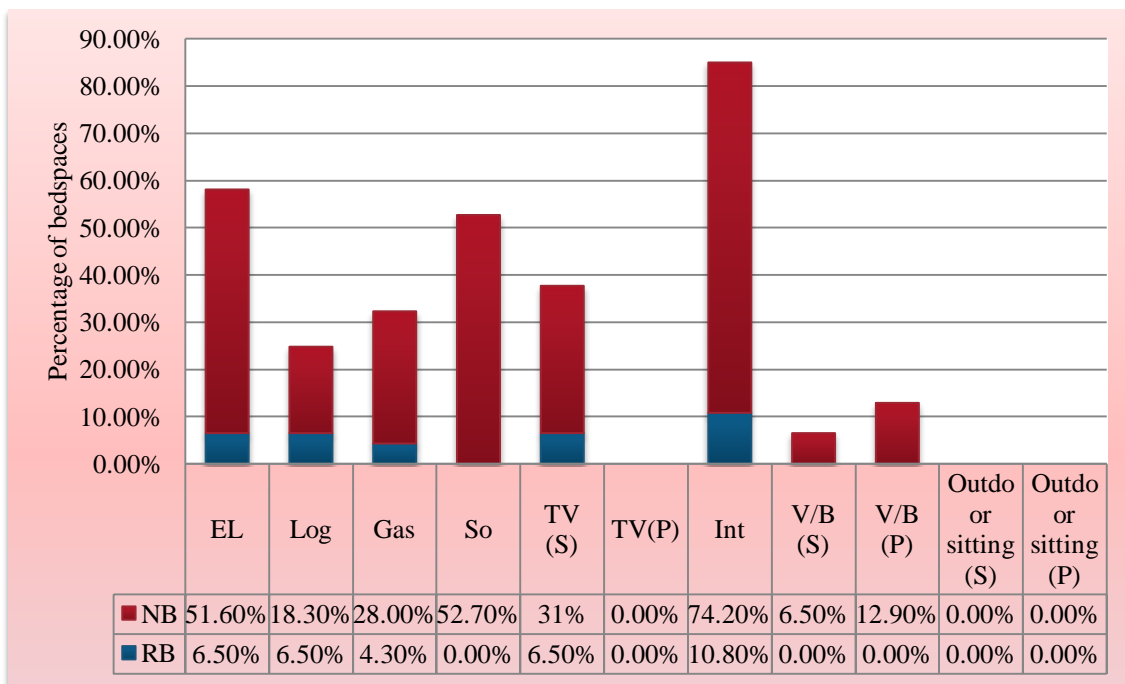


Figure 6.16: Naseby SC accommodation services - energy sources, facilities and spaces (2011)

- El: Electricity
- So: Solar system
- TV (S): Share TV
- TV (P): Private TV
- Int: Internet
- V/B (S): Share veranda/ balcony
- V/B (P): Private veranda/balcony
- Outdoor sitting (S): Share outdoor sitting
- Outdoor sitting (P): Private outdoor sitting

b. B&B Energy Sources, Facilities and Open air Spaces (2011)

Figure 6.17 and Appendices 22 and 24 demonstrate that of 28 B&B bed spaces 23 (82.1%) NB and 5 (17.9%) RB use electricity for heating. In addition, 12 (24.7%) NB B&B bed spaces have a solar system for heating (water-heating) (Figure 6.17 and Appendix 24).

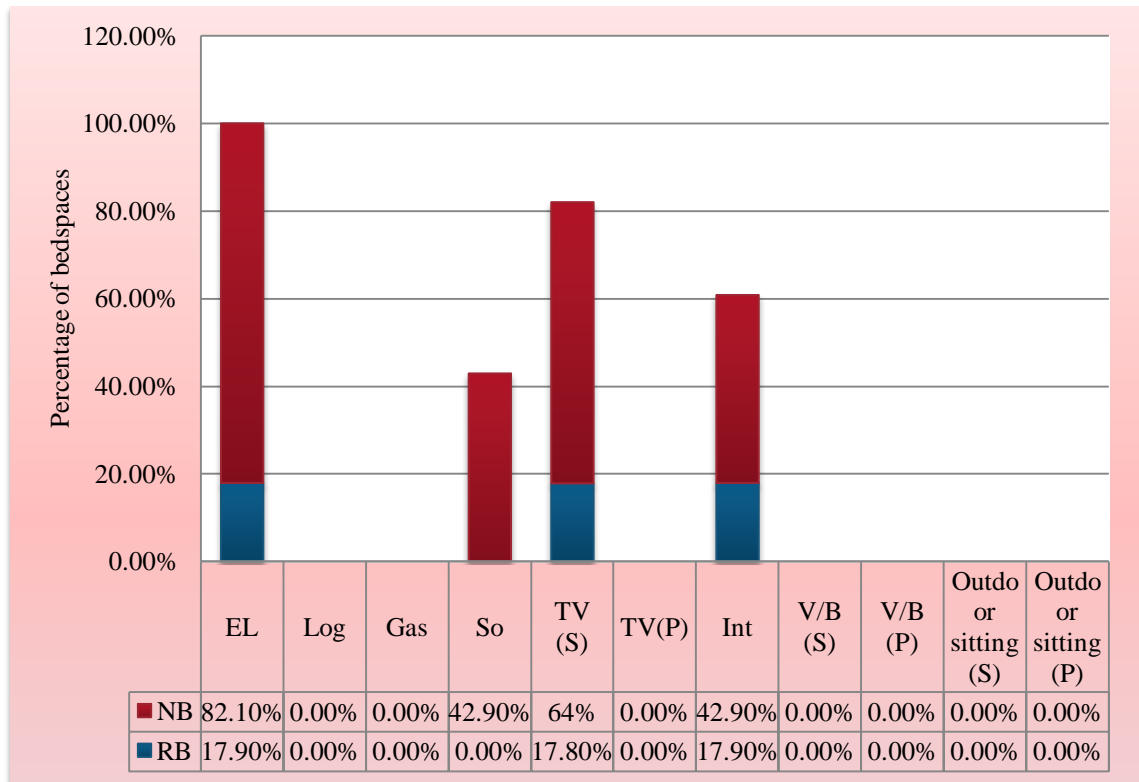


Figure 6.17: Naseby B&B accommodation services - energy sources, facilities and spaces (2011)

As illustrated in Figure 6.17 and shown in Appendix 24, 23 (82.1 %) out of 28 Naseby-B&B bed spaces including 5 (17.8%) RB and 18 (64.3%) NB bed spaces have a shared TV. Likewise, 17 (60.8%) of 28 Naseby B&B bed spaces including 5 (17.85%) RB and 12 (42.85%) NB have access to the Internet (Figure 6.17 and Appendix 24).

c. Hotel Energy Sources, Facilities and Open Air Spaces (2011)

As illustrated in Figure 6.18 and shown in Appendices 22 and 25, all 58 (100%) Naseby-hotel accommodation services are refurbished buildings and use electricity as the main source for heating. Moreover, 40 (69%) of these bed spaces also use logs (Figure 6.18 and Appendix 25). Furthermore, 18 (31%) of 58 hotel bed spaces have a shared TV and 18 (31%) have outdoor sitting areas (Figure 6.18 and Appendix 25).

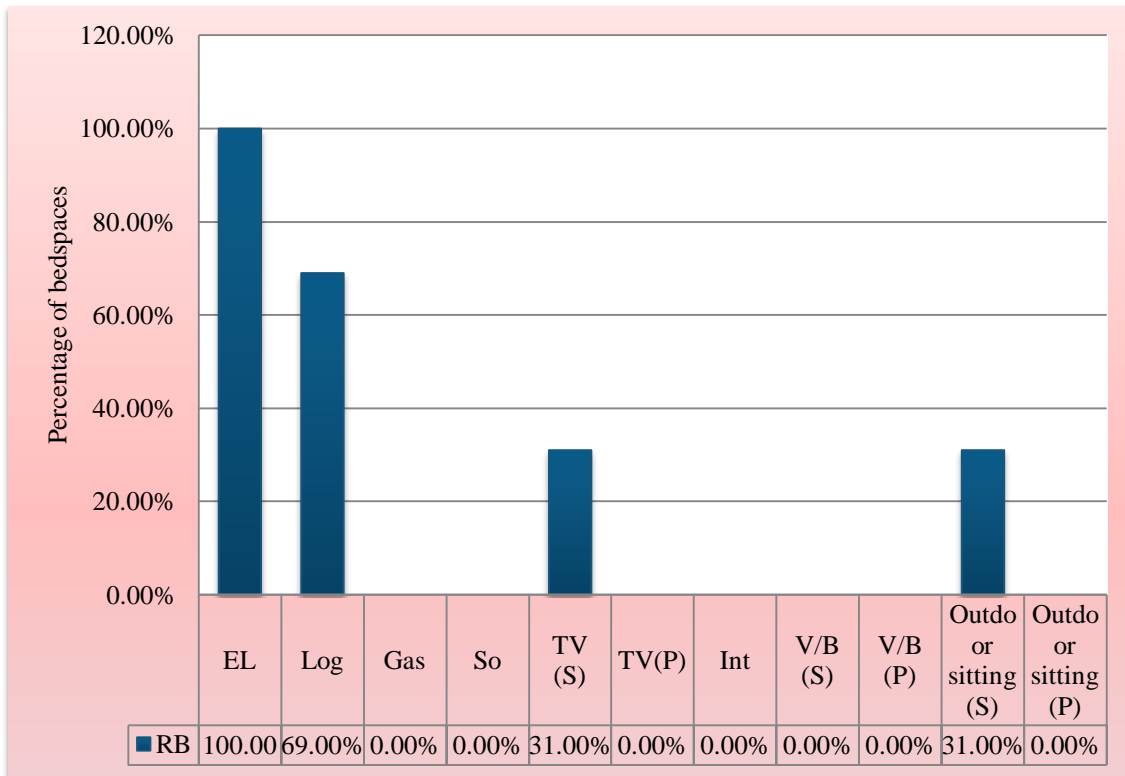


Figure 6.18: Naseby hotel accommodation services - Energy sources, facilities and spaces (2011)

d. Camping Energy Sources, Facilities and Open Air Spaces (2011)

Figure 6.19 and Appendix 26 show that of 432 Naseby camping sites (powered and non-powered), 288 (66.7%) powered sites use electricity for heating cabins and caravans, lighting and other services such as a BBQ and also have access to the Internet.

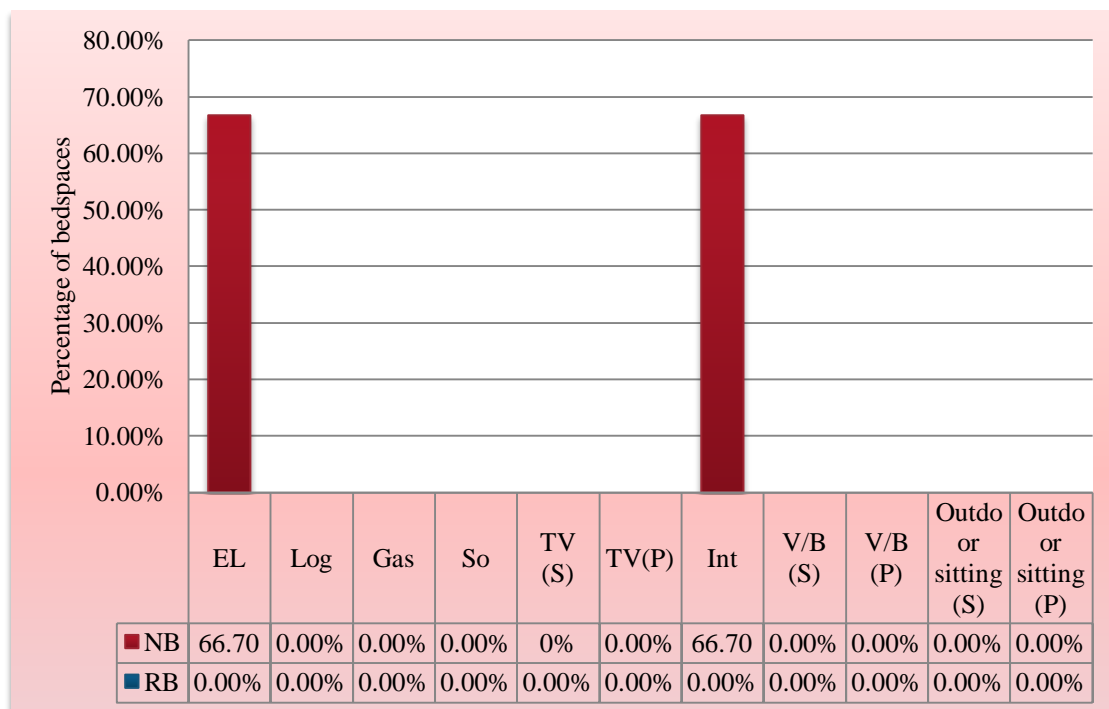


Figure 6.19: Naseby camping accommodation services - energy sources, facilities and spaces (2011)

e. All Types of Naseby Accommodation Services Energy Sources, Facilities and Open Air Spaces (2011)

Figure 6.20 and Appendix 27 indicate the energy sources, facilities and open air spaces in all types of Naseby accommodation services. As shown, of 611 Naseby bed spaces 428 bed spaces including 359 (58.70%) NB and 69 (11.30%) RB bed spaces use electricity for heating. In addition, of the same 611 Naseby bed spaces, 63 including 17 (2.8%) NB and 46 (7.5%) RB use logs (Figure 6.20 and Appendix 27). Furthermore, as shown in Figure 6.20 and Appendix 27, of the 611 Naseby bed spaces 30 (4.9%) bed spaces including 26 (4.3%) NB and 4 (0.6 %) RB use gas, and 61(10%) NB bed spaces have a solar system for heating water.

Figure 6.20 and Appendix 27 show that 76 (12.4%) of 611 Naseby bed spaces including 47 (7.7%) NB and 29 (4.7%) RB bed spaces have access to a shared TV and 384 (62.8%) including 369 (60.4%) NB and 15 (2.4%) RB rooms have access to the internet. Similarly, of the 611 Naseby bed spaces, 24 including 6 (0.9%) NB and 18 (3%) RB have access to a shared outdoor space and 12 (2%) have a private outdoor area (including veranda, balcony and open air seating).

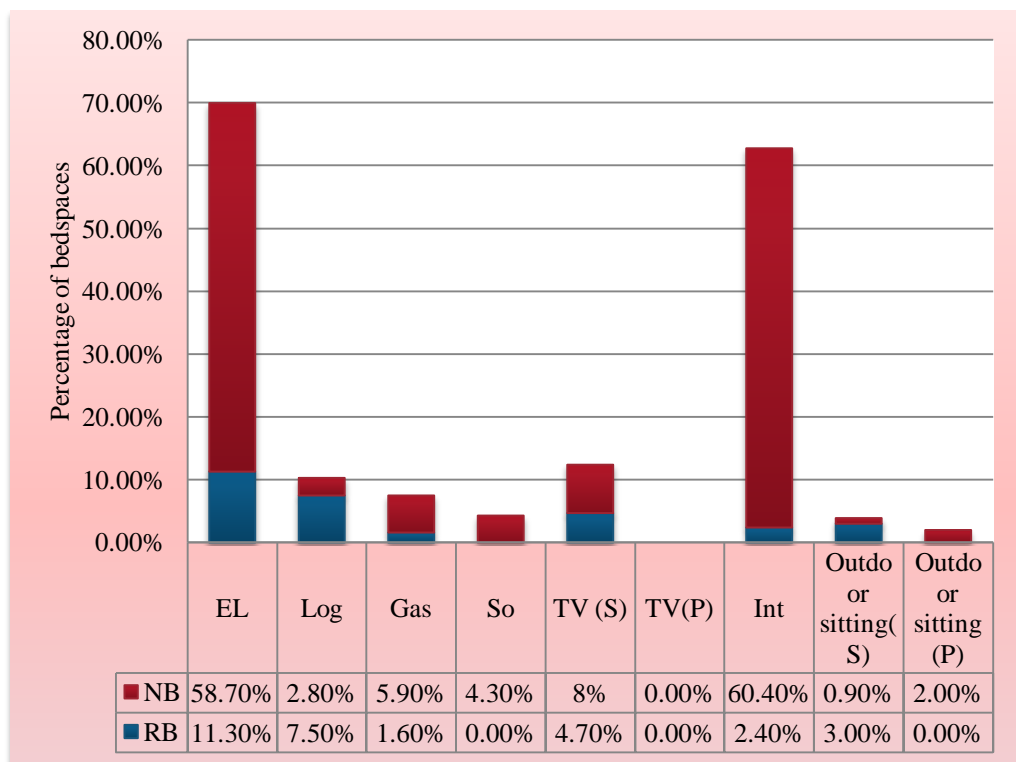


Figure 6.20: All types of Naseby accommodation services - energy sources, facilities and spaces

f. Comparison between NB and RB Bed Spaces in terms of Energy sources, Facilities and Open air spaces (2011)

Figure 6.21 makes a comparison between 538 (100%) NB (see Table 6.14) and 73 (100%) RB (see Table 6.14) bed spaces in terms of energy sources, facilities and open air spaces. As shown, 66.7% of NB and 94.5% of RB bed spaces use electricity for heating and 3.1% of NB and 67.1% RB bed spaces use logs. Likewise 4.8% of 538 NB and 5.5% of 73 RB bed spaces use gas for heating. Figure 6.21 illustrates that the solar heating is used by only 11.3% of NB bed spaces and RB bed spaces do not use this type of system (Figure 6.21). Furthermore, as shown in Figure 6.21, 8.7% of NB and 39.7% of RB bed spaces have a TV and 68.6% of NB and 20.5% of RB bed spaces have access to the Internet. Moreover, Figure 6.21 indicates that 3.3% of NB bed spaces use open air spaces, including veranda/balcony and outdoor seating.

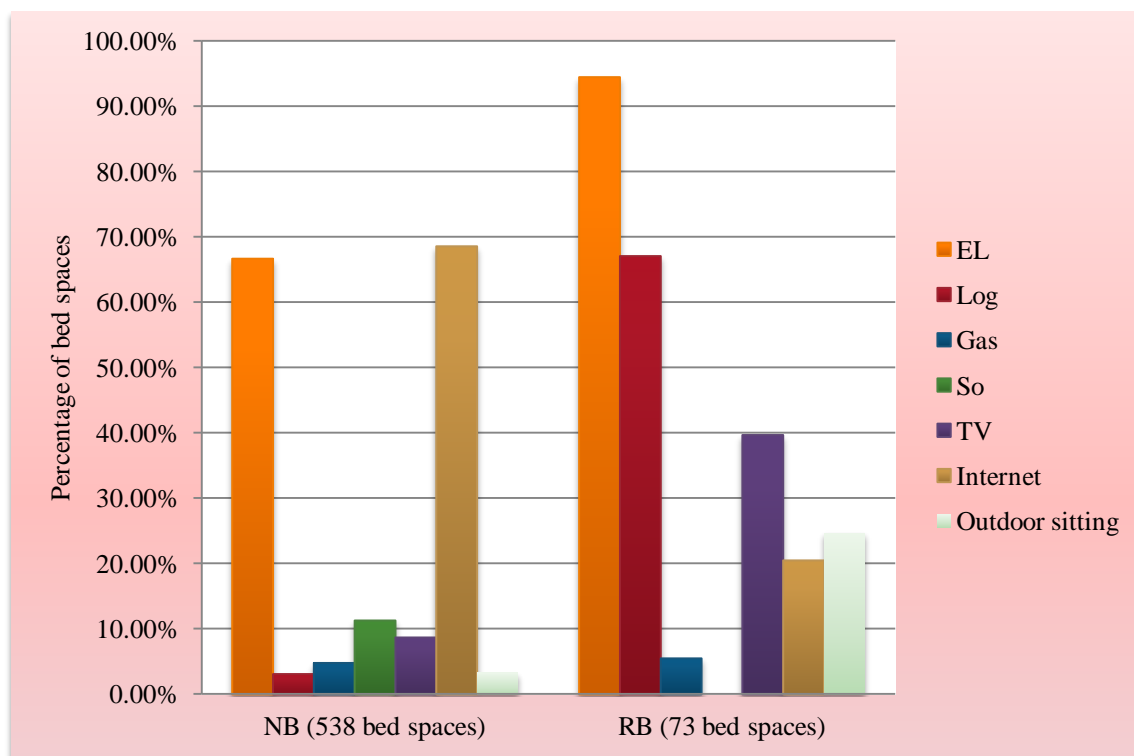


Figure 6.21: Comparison between NB and RB bed spaces in terms of energy sources, facilities and open air spaces (2011)

6.1.6.5. Occupancy Share

This thesis calculates the occupancy share of Naseby accommodation services based on the occupancy share of OCRT accommodation services cited in Table 5.19 (Chapter 5-section 5.6.5). Since the types of Bp and homestead accommodation are not found in Naseby, 50% of the sum of their occupancy share (cited in Table 5.19) has been in-

cluded in the occupancy share of Naseby SC and the other 50% has been included in the occupancy rate of Naseby B&B accommodation. Consequently, the occupancy share of Naseby SC is 13.1% (occupancy share of OCRT SC accommodation services cited in Table 5.19 + 8.5% (50% of total occupancy share of OCRT Bp and homestead cited in Table 5.19) = 21.6% (see Table 6.16). Similarly the occupancy of Naseby B&B is 22.4% (see Table 6.16).

Since there are no motels at Naseby, its occupancy share as cited in Table 5.19 has been added to the occupancy of Naseby hotels. As a result, the occupancy share of Naseby hotels is 21.1% (occupancy share of OCRT motels-) + 10.9% (occupancy share of OCRT-hotels cited in Table 5.19) = 32% (see Table 6.16).

Table 6.16 comprises the visitor nights of each type of Naseby accommodation service, which are calculated as: occupancy share of each type × total Naseby visitor nights (16,722 see Table 6.1). As shown in Table 6.16, Naseby hotels have the most visitor nights at 5,351 followed by camping sites (4,013), B&B (3,746) and SC (3,612).

Type of accommodation service	% of visitor nights (2005)	Visitor nights (2011)
SC	21.6 ¹	3,612
B&B	22.4 ²	3,746
Hotel	32 ³	5,351
Camping	24	4,013
Total	100	16,722 ⁴

1. SC % of visitor nights = 8.5% (50% of total Bp and homestead) + 13.1% (% of visitor nights of SC in 2005).
 2. B&B % of visitor nights= 8.5% (50% of total Bp and homestead) + 13.9% (% of visitor nights of B&B in 2005).
 3. Hotel % of visitor nights = 10.9 % + 21.1%
 4. See Table 6.1

6.1.6.6. Area of Naseby Accommodation Services

This thesis uses the average area per bed space of OCRT accommodation services (Table 5.20) as the average area per bed space of Naseby accommodation services. Table 6.17 indicates that the total area of 98 Naseby accommodation services is 8,144 m², including 2,744 m² SC, 2,592 m² camping, 1,688 m² hotel and 1,120 m² B&B.

Table 6.17 shows the annual occupied area of each type of Naseby accommodation services, calculated as its total area multiplied by its percentage occupancy rate. The total annual occupied area is 2,006 m², including 662 m² camping, 593 m² SC, 540 m² hotel and 251m² B&B.

Table 6.17: Naseby accommodation services - total area and occupied area (2011)

Type	No.	C	Area per bed (m ²) ¹	Total Area (m ²)	Occupancy (%)	Visitor nights	Occupied Area (m ²)
SC	18	93	29.5	2,744	21.6 ¹	3,612	593
B&B	6	28	40	1,120	22.4 ²	3,746	251
Hotel	2	58	29.1	1,688	32 ³	5,351	540
Camping	72	432	6	2,592	24	4,013	622
Total	98	611	-	8,144	-	16,722	2,006

1. See Table 5.20 (Chapter 5- section.5.66)

- No: Number of accommodation type
- C: Capacity

Table 6.18 contains the average area, number of bed spaces and total area of each type of Naseby accommodation service by their quality. In this table the area of each type of accommodation services is calculated as its average area/bed space multiplied by the number of bed spaces.

In comparison with other types of NB Naseby accommodation services, camping sites comprise the majority area of 2,592 m² followed by SC (2,449 m²) and B&B (920 m²) (Table 6.18). In addition, RB hotels contain the majority area of 1,688m² followed by SC (295 m²) and B&B (200m²) (Table 6.18).

Table 6.18: Naseby- area of accommodation services by type and quality

Category	Q	Average area/bed space (m ²)	Bed space	Area (m ²)
SC	NB	29.5	83	2,449
	RB	29.5	10	295
B&B	NB	40	23	920
	RB	40	5	200
Hotel	NB	29.1	-	-
	RB	29.1	58	1,688
Camping site	NB	6	432	2,592
	RB	-	-	-
Total	NB	-	538	5,961
	RB	-	73	2,183

Total area of Naseby NB accommodation services is 5,961m² and RB accommodation is 2,183 m² (Table 6.19), making a total of 8,144 m².

Table 6.19: Naseby- area of accommodation services by quality

Quality of buildings	Area (m ²)
NB buildings	5,961
RB buildings	2,183
Total	8,144

6.1.6.7. The EF of Naseby Accommodation Services

This chapter explores the EF of Naseby accommodation services through using three scenarios. In the first scenario, all buildings are assumed to be newly constructed (NB) and in the second scenario these buildings are split between NB and RB accommodation as found in 2011. However, in the first and second scenarios all areas of buildings (indoor and outdoor spaces including verandas and balconies) are assumed to be indoor spaces. In the third scenario that reflects the current position of Naseby accommodation services the buildings include the current NB and RB split and considers both indoor and open air (veranda and balcony) areas.

Comparison between the EFs of the first and the second scenarios can indicate the influence exerted on the EF of Naseby accommodation services by using refurbished buildings. In addition, comparison between the EFs of the second and the third scenarios determines the influence of using open air spaces on this EF.

a. First Scenario: All Buildings Are Assumed To Be New Buildings

a.1. The EF of SC Accommodation Services

As shown in Table 6.20, SC timber constructions with an area of 2,153 m² account for the largest portion of embodied energy of 47.4 GJ/year, followed by 354 m² timber and masonry (14.4 GJ/year) and 236m² mud brick mixed with other materials (6.6 GJ/year).

In Table 6.20, SC operational energy is assumed to be 0.3 (GJ/m²/year), equal with B&B operational energy use (Table 5.28). As determined in Table 6.20, SC timber construction accounts for the largest operating energy of 139.5 GJ/year, followed by timber and masonry (15.3 GJ/year) and mud brick mixed with other materials (15.3 GJ/year).

Table 6.20 also shows SC timber construction with an area of 2,153 m² has the largest life cycle energy of 186.9 GJ/year and other types of construction including timber mixed with masonry and mud brick mixed with other materials use 37.2 and 21.9 GJ/year respectively. Consequently, the total EF of Naseby SC accommodation is 2.4 gha including 1.8 gha as the EF of timber construction, 0.37 gha for timber and masonry construction, and 0.22 gha mud brick mixed with other materials.

Table 6.20: Naseby- life cycle energy use and the EF of self contained accommodation services (2011)

Material	Embodied energy over 50-year life cycle (GJ/m ²) ¹	Total Area (m ²) ²	Embodied energy (GJ/year)	Operational energy (GJ/m ² /year) ³	Occupied area (m ²) ⁴	Operating energy (GJ/year)	Life-cycle energy (GJ/year)	EF gha/year
Timber	1.1	2,153	47.4	0.3	465	139.5	186.9	1.87
Mud brick (mixed with other materials)	1.4	236	6.6	0.3	51	15.3	21.9	0.22
Timber and masonry	2.04	354	14.4	0.3	76	22.8	37.2	0.37
Total	-	-	68.4	-	-	177.6	246	2.46

1. See Table 5.27 (Chapter 5- section 5.6.8.1-a-8)

2. Total area of each type of SC construction = capacity of the type of construction (See Table 6.15) × SC average area per bed (29.5m²)

3. See Table 5.28 (Chapter 5- section 5.6.8.1- c-1) and Chapter 5- section 5.6.8.1-c-1

4. Occupancy rate of OCRT SC = 21.6% (See Table 6.16)

a.2. EF of B&B Accommodation Services

Table 6.21 demonstrates that 920 m² of Naseby B&B accommodation services of timber construction account for 20.4 GJ/year embodied energy and 354 m² Naseby B&B of mud brick construction use 14.4 GJ/year embodied energy.

In Table 6.21, B&B operating energy is assumed to be the same as that of the OCRT at 0.3GJ/m²/year (Table 5.28). As determined in Table 6.21, Naseby B&B accommodation services of timber construction use 61.8 GJ/year operating energy and B&B mud brick constructions use 13.5 GJ/year. Also, 920 m² of Naseby B&B accommodation of timber construction accounts for the largest life cycle energy of 82.2 GJ/year and B&B accommodation of mud brick construction is 19.1 GJ/year.

The total EF of Naseby B&B accommodation services as shown in Table 6.21 is 1.01 gha including 0.82gha for the EF of timber construction and 0.19 gha for the EF of mud brick mixed with other materials.

Table 6.21:Naseby- life cycle energy use of B&B accommodation services (2011)

Material	Embodied energy over 50-year life cycle (GJ/m ²) ¹	Total Area (m) ²	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year) ³	Occupied area (m ²) ⁴	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	920	20.4	0.3	206	61.8	82.2	0.82
Mud brick (with other materials)	1.4	200	5.6	0.3	45	13.5	19.1	0.19
Total		1,120	26			75.3	101.3	1.01

1. See Table 5.27 (Chapter 5: section 5.6.8.1-a-8)

2. Total area of each type of construction = capacity of the type of construction (see Table 6.15) × B&B average area per bed (40m²)

3. See Table 5.28 (Chapter 5: section 5.6.8.1- c-1) and Chapter 5: section 5.6.8.1-c-1

4. Occupancy rate of Naseby B&B = 22.4% (see Table 6.16)

a. 3. EF of Hotel Accommodation Services

Naseby hotel accommodation services comprise 524 m² timber and 1,164 m² mud brick (mixed with other materials) and account for 11.5 and 32.6 GJ/ year respectively of embodied energy (Table 6.22).

Hotel operating energy as shown in Table 6.22 is assumed to be 0.57 GJ/m²/year, equal to OCRT hotel operating energy use as cited in Table 5.28. As determined in Table 6.22, in Naseby, the annual operating energy of timber hotels is 95.8 GJ/year and mud brick is 212 GJ/year. In addition total life cycle energy use of Naseby hotels is 307.8 GJ/year this being the sum of the life cycle energy of timber (95.8 GJ/ year) and mud brick (212 GJ/year) hotels.

As shown in Table 6.22 the total EF of Naseby hotel accommodation services is 3.47 gha, made up of the EF of timber hotels (1.07gha) and mud brick mixed with other materials hotels (2.4gha).

Table 6.22: Naseby - Life cycle energy use of Hotel accommodation services (2011)

Material	Embodied energy over 50-year life cycle (GJ/m ²) ¹	Total Area (m ²)	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year) ³	Occupied area (m ²) ⁴	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	524	11.5	0.57	168	95.8	107.3	1.07
Mud brick (mixed with other materials)	1.4	1,164	32.6	0.57	372	212	244.6	2.4
Total	-	-	44.1	-	-	307.8	366.3	3.47

1. See Table 5.27 (Chapter 5: section 5.6.8.1-a-8)

2. Total area of each type of construction = capacity of the type of construction (see Table 6.15) × hotel average area per bed (29.1m² – see Table 5.20)

3. See Table 5.28 (Chapter 5: section 5.6.8.1-c-1) and Chapter 5: section 5.6.8.1-c-1

4. Occupancy rate of Naseby Hotels = 32% (see Table 6.16)

a. 4. EF of Camping Accommodation Services

As determined in Table 6.23 the embodied energy of Naseby camping sites is not available and this study considers the operating energy of this type of accommodation service to be equal to its life cycle energy. Table 6.23 indicates that the total EF of 288 Naseby powered sites with 2,689 visitor nights and 0.025 GJ/visitor night operating energy use is equivalent to 0.67 gha

Table 6.23: Naseby- life cycle energy use of Camping (powered sites) accommodation services (2011)

Material	Embodied energy over 50-year life cycle (GJ/m ²)	Total visitor nights	Embodied energy (GJ/year)	Operation energy (GJ/visitor night) ²	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Assumed negligible	N/A	2,689 ¹	N/A	0.025	67.2	67.2	0.67

1. 2,689 visitor nights = 66.7% (portion of camping bed spaces that are powered) of total camping (powered and non powered camp sites) visitor nights (4,013 visitor nights).

2. See Table 5.28

Total available powered camping bed spaces = 288

a. 5. EF of Naseby Accommodation Services (First Scenario)

The total 2011 EF of 98 Naseby accommodation services based on the assumption that all are NB is 7.6gha/year (Table 6.24). As determined in Table 6.24, Naseby hotel accommodation services have the largest EF of 3.47 gha followed by SC (2.46 gha), B&B (1.01gha) and camping (powered sites) 0.67 gha.

Table 6.24: The total EF of Naseby accommodation services (first scenario)

Types of accommodation	EF (gha/year)
SC	2.46
B&B	1.01
Hotel	3.47
Camping	0.67
Total	7.6

b. EF of Naseby Accommodation Services (Second Scenario)

In the second scenario the embodied energies of RB buildings are subtracted from the whole life cycle energy use of Naseby accommodation services. Consequently, the life cycle energy of Naseby accommodation services in the second scenario includes the embodied energy of NB plus the total operating energy of both RB and NB buildings. As RB accommodation services use the same energy sources and have the same facilities as NB buildings, their operational energy use is assumed to be the same as that of NB (Table 6.25). In Table 6.25, the embodied energies of NB and RB accommodation services are calculated through the following equation:

Embodied energy of NB/RB accommodation services = total embodied energy × percentage of NB/RB bed spaces

For example in Table 6.25, the total embodied energy of SC accommodation services is 68.4 GJ/year. NB SC bed spaces contain 89.2% (83 out of 93) of the total 93 SC bed spaces (see Figure 6.13). Consequently, the embodied energy of NB SC accommodation services is equivalent to: $68.4 \text{ GJ/year} \times 89.2\% = 61.1 \text{ GJ/year}$ (Table 6.25).

Table 6.25 demonstrates that in the second scenario, the total life cycle energy use of Naseby accommodation services is 710.3 GJ/year (Table 6.25). Likewise the EF of Naseby accommodation services is $710.3 \text{ GJ/year} \div 100 \text{ GJ/ha}$ (global average carrying capacity of land) = 7.1 gha (Table 6.25).

Table 6.25:Naseby accommodation services- life cycle energy of new and refurbished buildings

Type	Total embodied energy (GJ/year)	NB- Bed space (%)	RB- Bed space (%)	Embodied energy of NB (GJ/year)	Total operating energy (GJ/year)	Life-cycle energy (GJ/year)	EF (gha/year)
SC	68.4	89.2	10.8	61.1	177.6	238.7	2.38
B&B	26	82.1	17.9	21.3	75.3	96.6	0.96
Hotel	44.1	0.00	100	0.00	307.8	307.8	3.08
Camping	N/A	100	0.00	N/A	67.2	67.2	0.67
Total	157.88	-	-	86.6	589.45	710.3	7.1

- Total area of Naseby accommodation services = 8,144 m² (see Table 6.17)
- Total EF of Naseby accommodation services = 7.1 gha
- The EF of Naseby accommodation services gha/m² = 7.1 ÷ 8,144 = 0.00087

Table 6.26 compares the EF of Naseby accommodation services arising from the two scenarios (EF1 and EF2). It shows the influence of using RB buildings as accommodation means the EF is decreased by 6.6% (0.5 gha) from 7.6 gha to 7.1gha. As the total area of Naseby RB accommodation services is 2,183 m², the EF reduction per m² is: 0.5 gha (5,000m²) ÷ 2,183 m² = 2.3 m². This means using 1m² RB buildings as accommodation services can reduce the EF of Naseby accommodation services by 2.3 m².

Table 6.26: Reduced EF of Naseby accommodation services by use of RB as tourism accommodation

EF1 (all buildings are assumed to be new)	EF2 (Accommodation services include NB and RB)
7.6 gha/year	7.1 gha/year

- Reduced EF of Naseby influenced by the use of RB (11.9% of total bed spaces) as a part of accommodation services = 0.5 gha/year= 6.6% of EF1

c. EF of Naseby Accommodation Services (Third Scenario)

This section attempts to determine the influence of using open air spaces including verandas and balconies (V/B) on the EF of Naseby accommodation buildings. In the second scenario, calculation of the EF of Naseby accommodation services has been conducted based on the assumption that all NB and RB spaces are indoor spaces. In this scenario both indoor and outdoor spaces and their EFs are considered. The difference between the results of the second and third scenario indicates the influence of using open air areas on EF of Naseby accommodation services.

The number of V/B and outdoor sitting areas by type (shared and private) were found through using Naseby accommodation websites (see Appendix 5- rows 75-90). Table 6.27 contains summarised information about the numbers and types of V/B and outdoor sitting areas by type of accommodation, as explained in Appendix 5 (rows-75-90). Table 6.27 shows that 6 Naseby SC bed spaces have access to 1 shared V/B and 12 bed

spaces can use 6 private V/Bs. Furthermore, as shown in Table 6.27, 18 Naseby hotel bed spaces have access to 1 shared outdoor sitting area.

Table 6.27: Naseby- outdoor areas used as part of accommodation services

Type	V ¹ /B ²				Outdoor sitting			
	S ³	NV ⁴	P ⁵	NV	S	No ⁶	P	No
SC	6	1	12	6	-	-	-	-
B&B	-	-	-	-	-	-	-	-
Hotel	0	0	0	0	18	1	-	-

1. V: Veranda
 2. B: Balcony
 3. S: Number of bedrooms sharing area
 4. NV: Number of veranda/ balcony
 5. P: Number of bedrooms using private area
 6. No: Number of outdoor sitting spaces.

Table 6.28 shows that the embodied energy of 100.1m² Naseby V/Bs is 1.2 GJ/year. Since V/Bs are open areas and do not use operating energy (in particular for heating), their operating energy is assumed to be zero. As a result, the life cycle energy use of 100.1m² V/B is equal to its embodied energy (1.2 GJ/year) and its EF is 1.2 GJ/year (life cycle energy use) ÷ 100 (global average carrying capacity of land) = 0.012 gha (Table 6.28).

Table 6.28. Naseby accommodation services, life cycle energy and EF of outdoor sitting space (veranda/ balcony)

Type	Embodied energy (GJ/m ² per year)	Area (m ²) ¹⁻²	Embodied energy (GJ/year)	Operating energy	Life-cycle energy (GJ/year)	EF (gha)
Veranda/balcony	0.012 ³	100.1	1.2	0	1.2	0.012

1. Total number of verandas/ balconies = 7 (See Table 6.27)
 2. Average area (m²) of veranda/balcony = 14.3 (Table 5.40)
 3. Embodied energy of veranda/ balcony (GJ/m²/year) = 0.012 (Table 5.42)

In Table 6.29 the total 8,144 m² of Naseby-accommodation services (see Table 6.17) is separated into the two areas of 8,043.9 m² indoor spaces and 100.1m² V/B. The EF of Naseby accommodation services (indoor spaces) as shown in Table 6.25 is 0.00087gha/m² (7.1gha ÷ 8,144 m²). Thus the EF of 8,043.9 m² indoor spaces is 8,043.9m²× 0.00087 gha/m² = 7 gha (Table 6.29). Likewise the EF of 100.1m² V/B is 0.012 gha (see Table 6.28). As a result the total EF of 8,144 m² Naseby accommodation services including 8,043.9 m² indoor spaces and 100.1m² V/B is the sum of 7 and 0.012gha = 7.012gha (Table 6.29).

As shown in Table 6.26, the EF from the second scenario in which all Naseby accommodation services are assumed to be indoor spaces (EF2) is 7.1 gha. Moreover, in third scenario where outdoor spaces are the total EF (EF 3) is 7.012 gha. Thus 0.09 gha as the difference between the two EFs (EF2 and EF 3) can be considered as the reduction in Naseby EF from the use of 100.1m² verandas and balconies (Table 6.29). On the other hand, as 0.09 gha (900 m²) ÷ 100.1m² = 8.9 m², it can be considered that using 1m² V/B reduces the EF of Naseby accommodation services by 8.9 m².

Table 6.29: EF of Naseby accommodation services influenced by the use of veranda/balcony

Indoor spaces and powered camping sites			Outdoor sitting (Veranda/balcony)		
Area (m ²)	EF (gha/m ²)	EF (gha)	Area (m ²)	EF (gha/m ²)	EF (gha)
8043.9	0.00087	7	100.1	0.00012	0.012

- Total area of Naseby accommodation services (m²) = 8,144 (see Table 6.19).
- Total EF of Naseby accommodation services (second scenario) (gha)= 7.1 (see Table 6.25)
- Total EF of Naseby accommodation services (indoor space + veranda/balcony) (gha) = 7.012
- Reduction in Naseby EF by use of veranda and balcony (1.2% of 8,043.9 m²) = 0.09 gha = 900 m²
- Reduction in Naseby EF by use of 1m² veranda and balcony = 8.9 m²

6.1.7. Naseby Tourism Products and Activities (Frequency)

This section investigates the environmental impacts of Naseby visitor activities (as a part of their social cultural behaviour) through calculation of their EF. The frequency of activities offered by Naseby accommodation services to visitors is found through official websites of the OCRT and 15 websites of 93 Naseby accommodation services. The offered activities are explained in Appendix 5 (rows 75-90) and they are classified into indoor and outdoor activities in Appendix 28.

In addition the frequency of the activities offered, shown in Appendix 28 and summarised in Tables 6.31 and 6.32, can be considered as an indicator of the attitude of Naseby participants and members (in this case accommodation owners) to sustainable tourism activities. Comparison between EFs of the conducted activities and their frequency also can indicate a social-ecological perspective of the attitude of Tourism participants to being sustainable.

6.1.7.1. Local Produce

Table 6.30 indicates that 12.2 % (12) of 98 Naseby accommodation services offer local products to their visitors. As demonstrated in Table 6.30, of these 10 (83%) offer home

cooked food (local food) and 2 (17%) offer wine to their visitors. The environmental effects of using home cooked foods have been discussed in section 6.1.5.1.

Table 6.30: Naseby local produce (summary)

Produce	F	%
Local food and beverage	10	83
Wine	2	17
Total	12	100

• Total number of Naseby accommodation services = 98 (see Table 6)

6.1.7.2. Tourism Activities

This section investigates the environmental impacts of Naseby visitor activities (as a part of their social-cultural behaviour) through calculation of their EF.

a. Tourism Indoor Activities (Frequency)

Table 6.31 summarises the indoor activities offered by Naseby accommodation services to their visitors as cited in Appendices 5 and 28. These activities are classified into four types; indoor sport (curling at Naseby), education, music, and cultural/spiritual activities (Table 6.31).

Table 6.31: Naseby indoor activities offered by accommodation services to visitors

Activities	F ¹	% ²
Indoor sports (curling at Naseby).	16	84
Education.	1	5
Music	1	5
Cultural/spiritual activities.	1	5
Total	19	100

1. Frequency
2. Percentages have been rounded

Figure 6.22 and Table 6.31 determine that indoor visitor activities are dominated by sports (curling) at 16 offerings (84%) followed by other indoor activities with 1 offering each (5%).

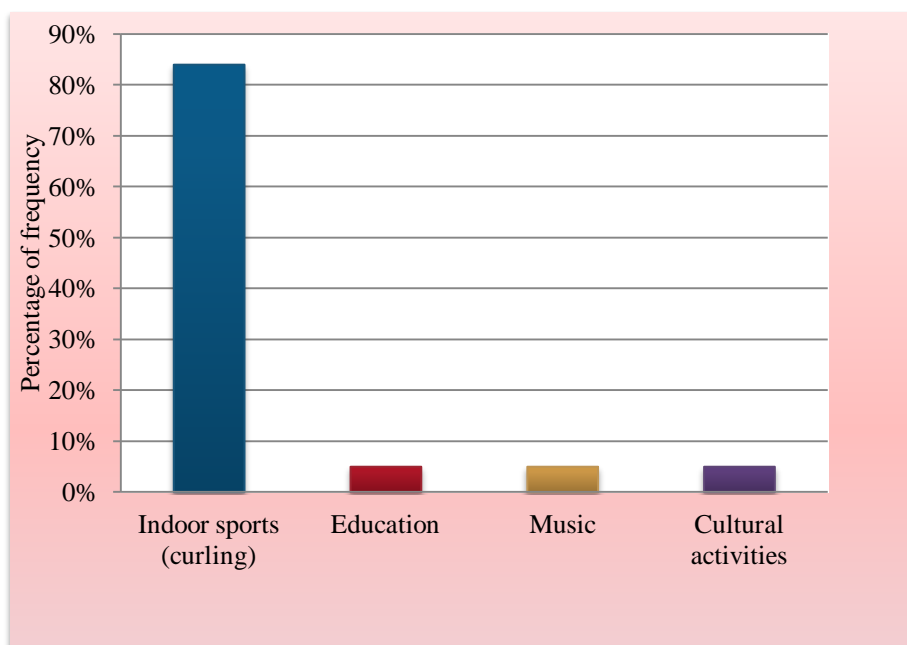


Figure 6.22: Naseby - frequency of indoor activities offered by accommodation services to visitors (2011)

b. Outdoor Activities (Frequency)

This study explores 11 types of outdoor activity offered by Naseby accommodation services to visitors in 2011 as shown in Appendix 28. These outdoor activities are explained by their related accommodation service in Appendix 5. This study classifies the 11 types of Naseby outdoor activities into the 8 types of activity shown in Table 6.32.

Table 6.32: Naseby- frequency of outdoor activities offered by accommodation services to visitors.

Outdoor activity	F	% ¹
Water sports	19	18.6
Walking	15	14.7
Winter sports	14	13.7
Cycling	14	13.7
Motorised sports and activities	13	12.7
Recreational activity	11	10.8
Sports (at playground)	9	8.8
Sports on horseback	7	6.9
Total	102	100

1. Percentages have been rounded

Figure 6.23 and Table 6.32 illustrate that the activity most offered is water sports with 19 mentions (18.6%), followed by walking 15 (14.7%), and winter sports and cycling 14 (13.7%) each. The frequency of offering other Naseby outdoor activities falls in a range of 7-13 times (Figure 6.23 and Table 6.32).

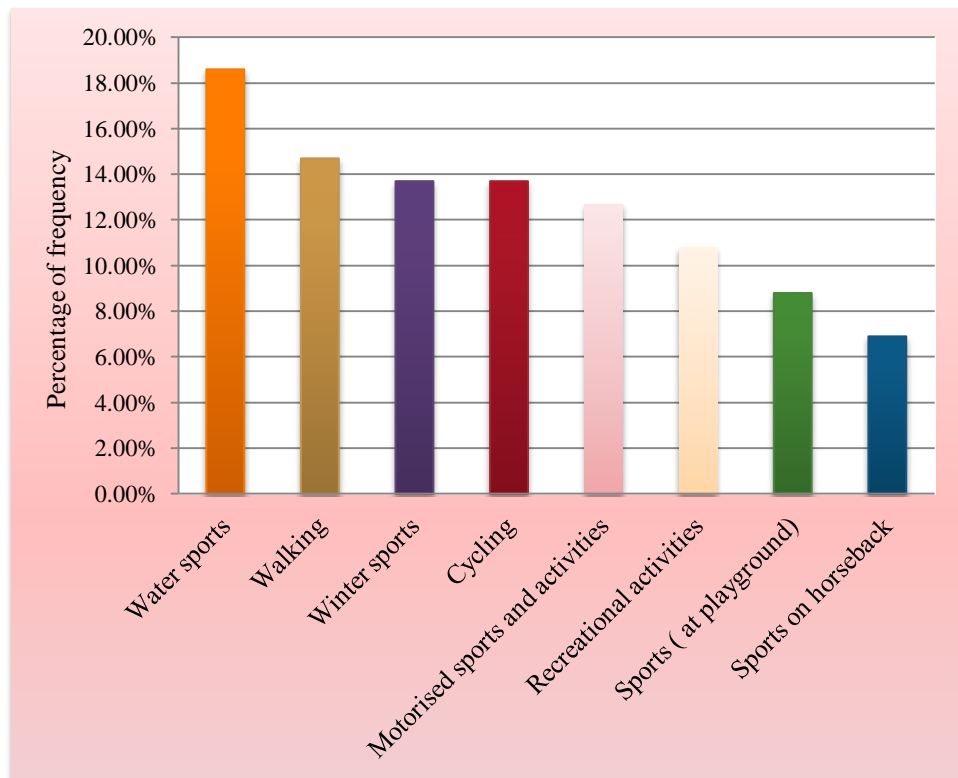


Figure 6.23: The frequency of outdoor activities offered by Naseby accommodation services to visitors

c. Frequency of the Subjects to Visit Offered by Accommodation Services

As shown in Appendix 5, this study looks at what is offered by way of places to visit by Naseby accommodation services in 2011. Appendix 28 contains summarised information about Naseby visiting activities and their frequency is shown in Appendix 5. Naseby subjects to visit are here put into seven categories; Naseby itself, historical sites and buildings, scenery, museum, gold mining heritage, Naseby town garden, and art, sculpture, and gardens (Appendix 28). Table 6.33 and Figure 6.24 further classify these seven categories into five; cities and villages, historical sites and buildings, scenery, museum, and town garden. As illustrated in Figure 6.24 and Table 6.33, cities and villages, and historic sites and buildings occur at a similar frequency of 13 mentions (33.3%). In addition, scenery and museum have the same frequency of 6 (15.4%) and the town garden is only suggested once (2.6%) (Figure 6.24 and Table 6.33).

Subjects	F	%
Cities and villages (Naseby)	13	33.3
Historic sites and buildings	13	33.3
Scenery	6	15.4
Museum/art gallery	6	15.4
Town garden	1	2.6
Total	39	100

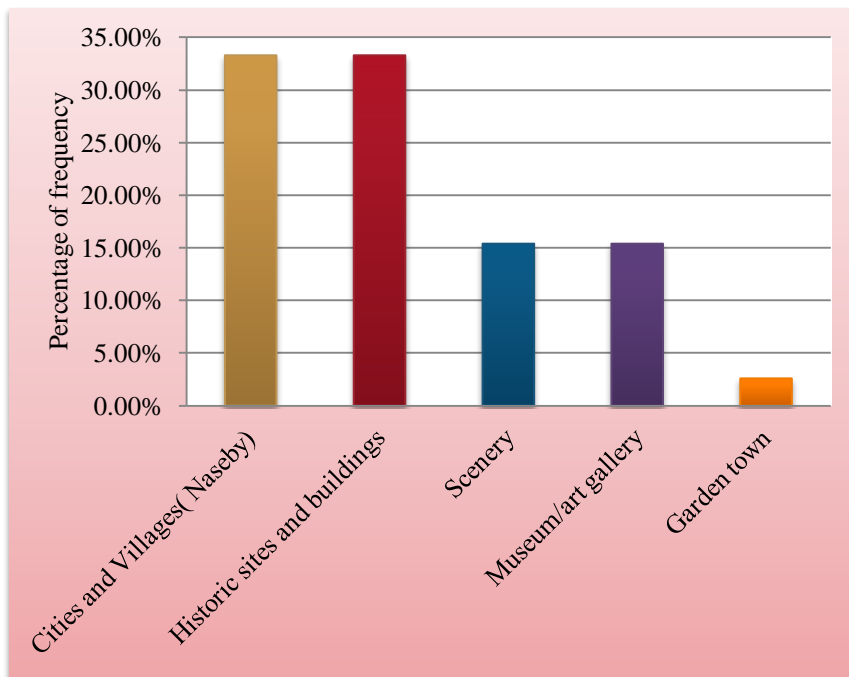


Figure 6.24: Naseby- frequency of subjects to visit offered by accommodation services

c. Activities per Visitor

This thesis calculates the number of Naseby visitors per activity (except curling and mountain biking at Naseby) through using the percentage split of 160 visitors Table 5.48) and applying this to the 4,645 Naseby visitors in 2011 (Table 6.34). The assumption is that the visitors who come for curling and mountain bike riding will also do other activities. The numbers of OCRT visitors who play curling and go mountain biking at Naseby is already known (see Table 4.45). Table 6.34 shows that in comparison with other Naseby activities, the majority visitor activity is curling (4,350), followed by Taieri Gorge Railway (2,151), visiting gold mining towns (1,626), sightseeing tours (1,421) and visiting old Cromwell town (1,045). The numbers of Naseby visitors who do other types of activity are between 28 and 758.

Activities	% of 4,645visitors ²	Number of Visitor activities
Curling (at Naseby)	93.6	4,350
Taieri Gorge Railway	46.3	2,151
Gold mining towns	35	1,626
Sightseeing tours	30.6	1,421
Old Cromwell town	22.5	1,045
Wineries	16.9	785
Visiting friends and relatives	15	697
Hayes engineering	8.1	376
Mountain biking Naseby	6.4	295
fishing	1.9	88
Golf	1.3	60
Swim at Ophir and Alexandra	0.6	28
Clyde dam Tour	0.6	28
Golden Progress mine	0.6	28
Walking	0.6	28
Ophir- high country farm	0.6	28
Biking	0.6	28
Fruit picking along trail	0.6	28

1. See Table 6.1
 2. % of 4,645 visitor assumed same as % of 160 visitors cited in Table 5.45 (excluding curling and mountain biking at Naseby).
 • Reference: CODC, 2011:18

6.1.8. EF of Visitor Activities

6.1.8.1. EF of Indoor Activities (Curling at Naseby)

As indicated in Table 5.56 (see Chapter 5, section 5.7.5.1-d), the total EF of 4,350 OCRT visitors who play curling at Naseby is 0.7 gha which is equivalent to 0.00016 gha/ visitor (Table 6.35).

Total number of Naseby visitors	% of Naseby visitors who play indoor curling at Naseby Curling Centre ¹	Total number of Naseby visitors who play curling ¹	EF of 13,000 visitors of Curling centre (gha)	EF of 4,350 Naseby visitors (33.5 % of 13,000 Naseby curling visitors) gha ²
4,645	93.6	4,350	2.07 ³	0.7

1. See Table 6.34
 2. EF of Naseby Curling Centre (indoor curling) per visitor per 3 hours playing/ year = (0.7 gha ÷ 4,350 visitors) 0.00016 (gha)
 3. See Table 5.56

6.1.8.2. EF of Outdoor Activities

a. EF of Walking

Tables 6.34 and 6.36 show that 28 Naseby visitors chose walking as a tourist activity. As shown in Chapter 5 (Table 5.58) the EF of a visitor who walks 3 hours is 0.00005 gha. Thus the EF of 28 Naseby visitors who walk 3 hours is equivalent to: $0.00005 \text{ (gha/visitor)} \times 28 \text{ (number of visitors)} = 0.0014 \text{ (gha)}$ (Table 6.36).

Table 6.36: Ecological footprint of Naseby visitors (walking).

Number of Naseby visitors who walk.	28 ¹
EF (gha) of Naseby visitor who walks 3 hours	0.00005 ²
EF of 28 Naseby visitors who walk 3 hours (gha)	0.0014
1. See Table 6.34	
2. See Table 5.58	

b. The EF of Golf

Tables 6.34 and 6.37 show 60 Naseby visitors played golf in 2011. Tables 5.60 and 6.37 indicate that the EF of a visitor who plays golf is 0.003gha/visitor. Consequently the EF of 60 Naseby visitors playing golf is $60 \times 0.003 \text{ gha/visitor} = 0.18 \text{ gha}$ (Table 6.37).

Table 6.37: Ecological footprint of Naseby visitors (golf)

Number of Naseby visitors who play golf	60 ¹
EF (gha) of Naseby visitor who plays golf	0.003 ²
EF of 60 Naseby visitors who play golf (gha)	0.18
1. See Table 6.34	
2. See Table 5.60	

c. EF of Mountain Biking

As shown in Tables 6.34 and 6.38, 295 Naseby visitors went mountain biking at Naseby in 2011. Tables 5.67 and 6.38 indicate that the EF of a visitor who goes mountain biking is 0.0009 gha/visitor. As a result the EF of 295 mountain biking Naseby visitors is $295 \times 0.0009 \text{ gha/visitor} = 0.27 \text{ gha}$ (Table 6.38).

Table 6.38: Ecological footprint of Naseby visitors (mountain biking)

Number of Naseby visitors who go mountain biking	295 ¹
EF (gha) of Naseby visitor who goes mountain biking	0.0009 ²
EF of 295 Naseby visitors who go mountain biking (gha)	0.27
1. See Table 6.34	
2. See Table 5.67	

d. EF of Fishing

In 2011, 88 Naseby visitors chose fishing as a leisure activity (Tables 6.34 and 6.39). Since the EF of a visitor fishing is 0.0009 gha (see Tables 5.68 and 6.39), the EF of 88 Naseby visitors fishing is $0.0009 \text{ (gha/visitor)} \times 88 \text{ (visitors)} = 0.08 \text{ gha}$ (Table 6.39).

Number of Naseby visitors who fish	88 ¹
EF (gha) of Naseby visitor who fishes	0.0009 ²
EF of 88 Naseby visitors fishing (gha)	0.08
1. See Table 6.34	
2. See Table 5.68	

e. EF of Swimming at Ophir and Alexandra

Tables 6.34 and 6.40 show 28 Naseby visitors went swimming at Ophir and Alexandra in 2011. Tables 5.69 and 6.38 determine that the EF of a visitor who swims is 0.0009 gha. As a result the EF of 28 Naseby visitors going swimming is $28 \times 0.0009 \text{ gha/visitor} = 0.025 \text{ gha}$ (Table 6.40).

Number of Naseby visitors who swim	28 ¹
EF (gha) of Naseby visitor swimming	0.0009 ²
EF of 28 Naseby visitors swimming (gha)	0.025
1. See Table 6.34	
2. See Table 5.69	

f. EF of Wineries

Tables 6.34 and 6.41 show that 785 Naseby visitors went to wineries. Tables 5.70 and 6.41 determine that the EF of a visitor going to a winery is 0.00006 gha/visitor. As a result the EF of 785 Naseby visitors who go to wineries is $785 \times 0.00006 \text{ gha/visitor} = 0.047 \text{ gha}$ (Table 6.41).

Number of Naseby visitors who visit wineries	785 ¹
EF (gha) of Naseby visitor to winery	0.00006 ²
EF of 785 Naseby visitors to wineries (gha)	0.047
1. See Table 6.34	
2. See Table 5.70	

g. EF of Sightseeing

Tables 6.42 and 6.34 indicate that 1,421 visitors chose sightseeing as one of their activities at Naseby. As explained in Table 5.71 (Chapter 5) the EF of a visitor sightseeing is

0.0009 gha. Consequently, the EF of 1,421 Naseby visitors is $1,421 \times 0.0009$ gha/ visitor = 1.3 gha (Table 6.42).

Table 6.42: Ecological footprint of Naseby visitors (sightseeing)	
Number of Naseby visitors sightseeing	1,421 ¹
EF (gha) of Naseby visitor sightseeing	0.0009 ²
EF of 1,421 Naseby visitors sightseeing (gha)	1.3
1. See Table 6.34	
2. See Table 5.71	

h. EF of Hayes Engineering

Hayes Engineering heritage was visited by 378 Naseby visitors as shown in Tables 6.34 and 6.43. Since the EF of a visitor in this case is 0.00006 gha (see Table 5.72) the EF of the latter visitors is equivalent to 376 (number of visitors) \times 0.00006 gha/visitor = 0.02 gha (Table 6.43).

Table 6.43: Ecological footprint of Naseby visitors (Hayes Engineering)	
Number of Naseby visitors to Hayes Engineering)	376 ¹
EF (gha) of a Naseby visitor to Hayes Engineering	0.00006 ²
EF of 376 Naseby visitors to Hayes Engineering (gha)	0.02
1. See Table 6.34	
2. See Table 5.72	

i. EF of Ophir High Country Farm

The total EF of 28 Naseby visitors who go to Ophir High Country Farm Tour is calculated as for the examples above. As shown in Table 6.44 it is 0.0017gha.

Table 6.44: Ecological footprint of Naseby visitors (Ophir High Country Farm)	
Number of Naseby visitors to Ophir High Country Farm	28 ¹
EF (gha) of Naseby visitor to Ophir High Country Farm	0.00006 ²
EF of 28 Naseby visitors to Ophir High Country Farm (gha)	0.0017
1. See Table 6.34	
2. See Table 5.73	

j. EF of Visitors to Taieri Gorge Railway

Using the same method as before the total EF of 2,151 Naseby visitors to the Taieri Gorge Railway is 0.13 gha (Table 6.45).

Table 6.45: Ecological footprint of Naseby visitors (Taieri)

Number of Naseby visitors to Taieri GR	2,151 ¹
EF (gha) of Naseby visitor to Taieri GR	0.00006 ²
EF of 2,151 Naseby visitors to Taieri GR	0.13
1. See Table 6.34	
2. See Table 5.74	

k. EF of Visitors to Gold Mining Towns

The total EF of 1,626 Naseby visitors who visit gold mining towns is 0.01 gha (Table 6.46).

Table 6.46: Ecological footprint of Naseby visitors (gold mining towns)

Number of Naseby visitors to gold mining towns	1,626 ¹
EF (gha) of Naseby visitor to gold mining towns	0.00006 ²
EF of 1,626 Naseby visitors to gold mining towns	0.01
1. See Table 6.34	
2. See Table 5.75	

l. EF of Visitors to Old Cromwell Town

The EF of a Naseby visitor to old Cromwell town is 0.063 gha (Table 6.47).

Table 6.47: Ecological footprint of Naseby- visitors (Old Cromwell town)

Number of Naseby visitors to old Cromwell town	1,045 ¹
EF (gha) of Naseby visitor to old Cromwell town	0.00006 ²
EF of 1,045 Naseby visitors to old Cromwell town	0.063
1. See Table 6.34	
2. See Table 5.76	

m. EF of Visitors to Friends and Relatives

The EF of a Naseby visitor who visits friends and relatives is 0.14 gha (Table 6.48).

Table 6.48: Ecological footprint of Naseby visitors (visiting friends and relatives)

Number of Naseby visitors to friends and relatives	697 ¹
EF (gha) of Naseby visitor to friends and relatives	0.0002 ²
EF of 697 Naseby visitors to friends and relatives	0.14
1. See Table 6.34	
2. See Table 5.78	

n. EF of Visitors on Clyde Dam Tour

The 28 Naseby visitors who participate in a Clyde Dam Tour have an EF of 0.025 gha (Table 6.49).

Table 6.49: Ecological footprint of Naseby visitors (Clyde Dam Tour)

Number of Naseby visitors on Clyde Dam Tour	28 ¹
EF (gha) of Naseby visitor on Clyde Dam Tour	0.0009 ²
EF of 28 Naseby visitors on Clyde Dam Tour	0.025
1. See Table 6.34	
2. See Table 5.79	

o. EF of Visitors to Golden Progress Mine

The EF of visitors to the Golden Progress Mine is 0.0017 gha (Table 6.50).

Table 6.50: Ecological footprint of Naseby visitors (Golden Progress Mine)

Number of Naseby visitors to Golden Progress Mine	28 ¹
EF (gha) of Naseby visitor to Golden Progress Mine	0.00006 ²
EF of 28 Naseby visitors to Golden Progress Mine	0.0017
1. See Table 6.34	
2. See Table 5.80	

p. EF of Visitors Fruit Picking Along Trail

The EF of 28 visitors fruit picking along the trail is 0.0017 gha (Table 6.51).

Table 6.51: Ecological footprint of Naseby visitors (fruit picking along trail)

Number of Naseby visitors fruit picking along trail	28 ¹
EF (gha) of Naseby visitor fruit picking along trail	0.00006 ²
EF of 28 Naseby visitors fruit picking along trail	0.0017
1. See Table 6.34	
2. See Table 5.81	

q. EF of Biking

The EF of 28 visitors biking as a tourist activity is 0.025 gha (Table 6.52).

Table 6.52: Ecological footprint of Naseby visitors (biking)

Number of Naseby visitors biking	28 ¹
EF (gha) of Naseby visitor biking	0.0009 ²
EF of 28 Naseby visitors biking	0.025
1. See Table 6.34	
2. See Table 5.66	

61.8.3. Total EF of Naseby Visitor activities

The total EF of Naseby visitor activities as shown in Table 6.53 is 3.02 gha. Table 6.53 and Figure 6.25 demonstrate that the four largest EFs are the EF of sightseeing (1.3gha) curling (0.7) at Naseby, mountain biking (0.27) and golf (0.18 gha). Furthermore, walking as a Naseby visitor activity has the smallest EF of 0.0014 gha (Table 6.53 and Figure 6.25).

Table 6.53: Total EF of Naseby visitor activities

Type of activity	Activities	Numbers of visitors per activity	% of total 4,645 Naseby visitors	EF (gha/visitor)	EF (gha)
Indoor activity	Curling at Naseby ¹	4,350	93.7	0.00016	0.7
Outdoor activities	Walking	28	0.6	0.00005	0.0014
	Golf	60	1.3	0.04	0.18
	Taieri	2,151	46.3	0.00006	0.13
	Gold mining towns	1,625	35	0.00006	0.01
	Sightseeing	1,421	30.6	0.0009	1.3
	Old Cromwell town	1,045	22.5	0.00006	0.063
	Wineries	785	16.9	0.00006	0.047
	Visiting friends and relatives	697	15	0.0002	0.14
	Hayes engineering	375	8.1	0.00006	0.02
	Mountain biking at Naseby ¹	295	6.4	0.0009	0.27
	Fishing	88	1.9	0.0009	0.08
	Swim at Ophir and Alexandra	28	0.6	0.0009	0.025
	Clyde dam Tour	28	0.6	0.0009	0.025
	Golden Progress mine	28	0.6	0.00006	0.0017
	Ophir high country farm	28	0.6	0.00006	0.0017
	Biking	28	0.6	0.0009	0.025
	Fruit picking along trail	28	0.6	0.00006	0.0017
Total		13,088	-	-	3.02

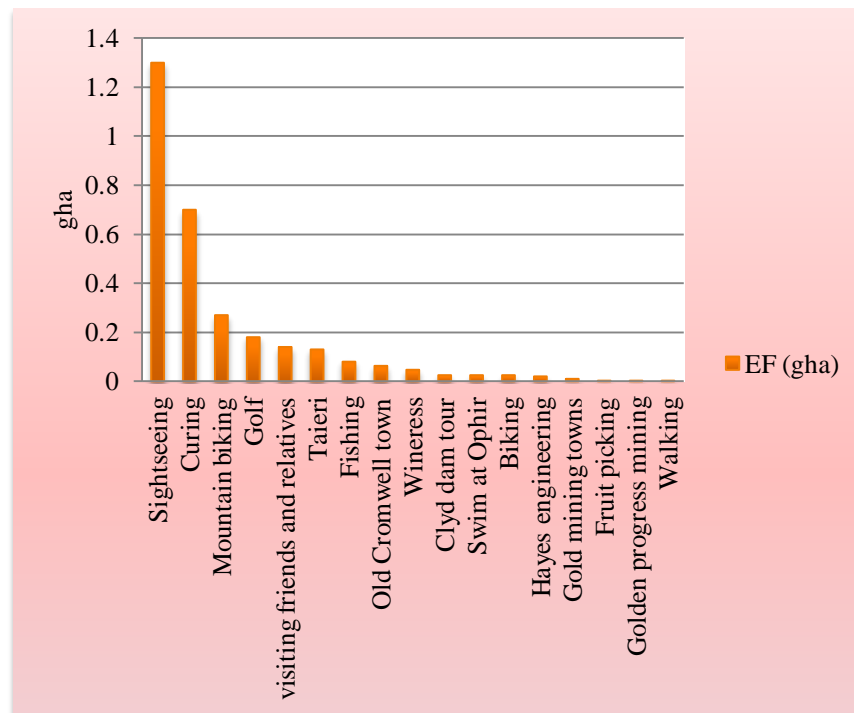


Figure 6.25: Naseby- EF of visitor activities (2011)

6.1.8.4. Comparison between the EFs of Indoor and Outdoor Activities

Table 5.54 shows that 4,645 Naseby visitors participate in 13,088 visitor activities. As a result the average number of activities per visitor is 2.8 activities, so each Naseby visitor engages in 2.8 activities proposed by the OCRT.

As shown in Table 6.54 and Figure 6.26, the EF of 4,350 Naseby visitors (33.2% of 13,088 visitors activities) who participate in indoor activity (curling at Naseby) is 0.7 gha that accounts for 23.12% of the total EF of Naseby activities (indoor and outdoor). Furthermore, Table 6.54 and Figure 6.26 indicate that the total EF of 8,738 Naseby-outdoor visitor activities (66.8% of 13,088 Naseby visitor activities) is 2.32 gha, or 76.20 % of the total EF of Naseby visitor activities (3.02gha).

Table 6.54. Comparison between EFs of Naseby- visitors- indoor and outdoor activities

Indoor activity					Outdoor activities				
Numbers of visitors-activities	% of 13,088 Naseby visitors-activities	EF (gha)	% total EF ¹	EF (gha/visitor)	Numbers of visitors-activities	% of total Naseby visitors	EF (gha)	% total EF ¹	EF (gha/visitor) ²
4,350	33.2	0.7	13.4	0.00016	8,738	66.8	2.32	86.6	0.00026

1. Percentage of the total 3.02gha EF of 13,088 Naseby visitor activities

- Total number of Naseby visitor = 4,645 (see Table 6.2)
- Total number of Naseby Visitor activities = 13,088 (see Table 6.51)
- Average number of activities per visitor = 13,088 ÷ 4,645 = 2.8

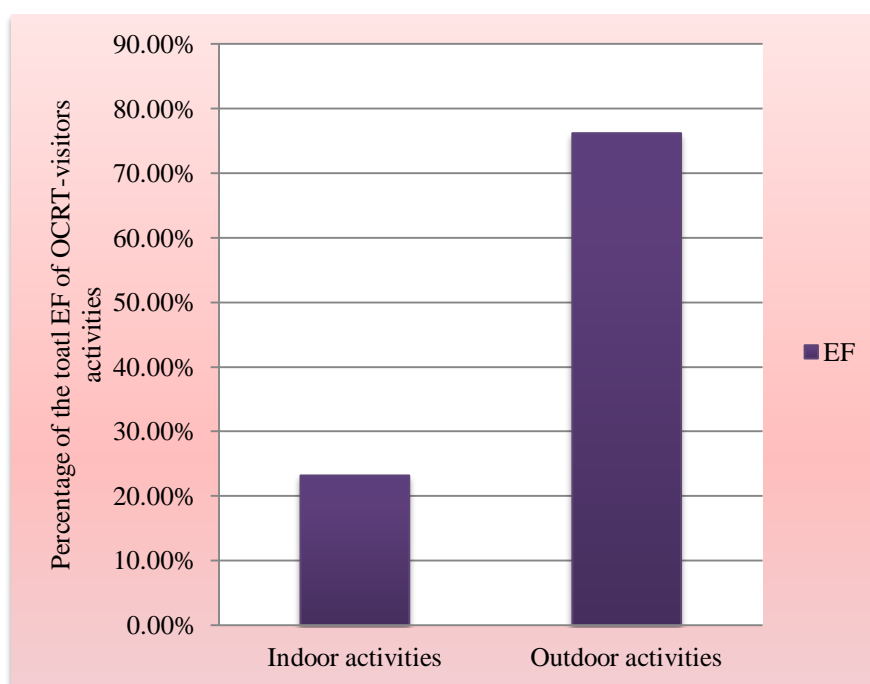


Figure 6.26: Comparison between EFs of Naseby indoor and outdoor activities

This Thesis selects curling as an indoor activity and golf as an outdoor activity with the biggest EF/visitor in their categories to be compared with the EF of walking as the outdoor activity with the smallest (Figure 6.27).

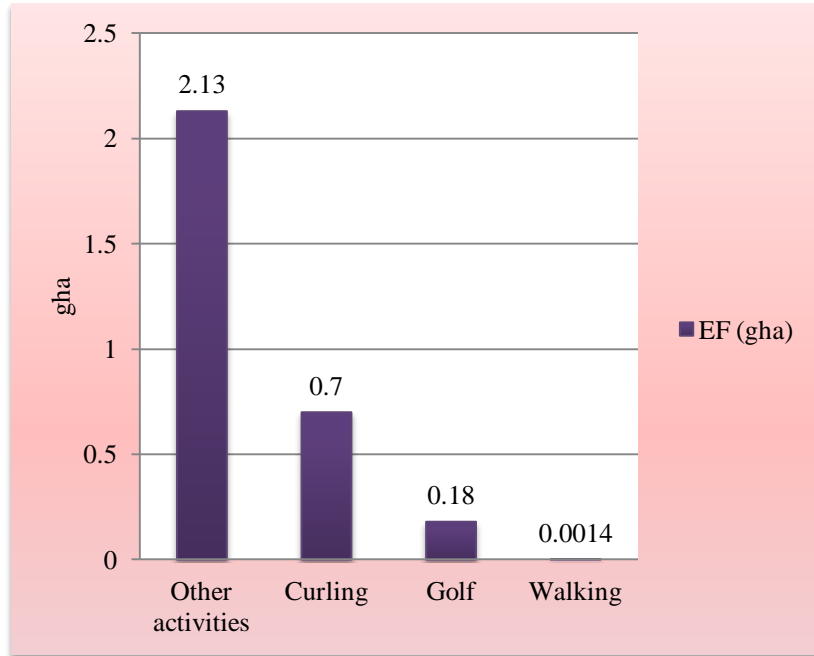


Figure 6.27: Naseby- Comparison between EFs of golf, curling, walking, and other activities excluding these three

Figure 6.28 determines that the majority of 8,650 Naseby visitor activities are within the ‘other activity’ category (excluding golfing, curling and walking) followed by curling (4,350), golfing (60) and walking (28).

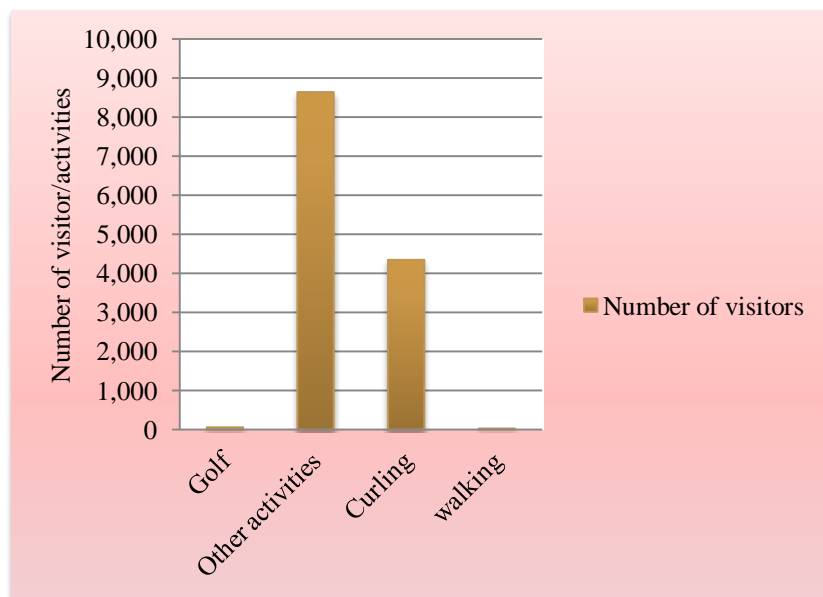


Figure 6.28: Naseby- Comparison between number of visitor activities for golf, curling, walking, and other activities

Since this study uses the same EF/visitor of activities as explained in Chapter 5, comparison between the EF/visitor of the four categories in Figure 6.28 can be conducted through using Figure 5.36 (Chapter 5- section 5.7.5.4) with the same results.

6.1.9. The Total EF of Naseby (2011)

Table 6.55 demonstrates that in 2011 the total EF of Naseby visitors is 632.75 gha. As shown in Table 6.55 and Figure 6.29 transportation accounts for the largest share of the total EF at 459.6gha (72.9%), followed by food at 160.9 gha (25.5%), accommodation services at 7.012 gha (1.1 %) and visitors’ activities at 3.02 gha (0.5%). However, the transportation EF that forms 72.9 % of the total EF of Naseby can be divided into 38.6 % of international transportation and 34.3% domestic transportation (see Chapter 6- section 6.4.3 and Table 6.8).

Category	EF (gha)	%
Transportation	459.6 ¹	72.9
Food (second scenario)	160.9 ²	25.5
Accommodation (third scenario)	7.012 ³	1.1
Activities	3.02 ⁴	0.5
Total	630.53	100

1. See Table 6.8
 2. See Table 6.12
 3. See Table 6.29
 4. See Table 6.52

- Total number of Naseby visitors (2011) = 4,645
- EF (gha/visitor) of Naseby = 630.53(gha) / 4,645 (visitors) = 0.14

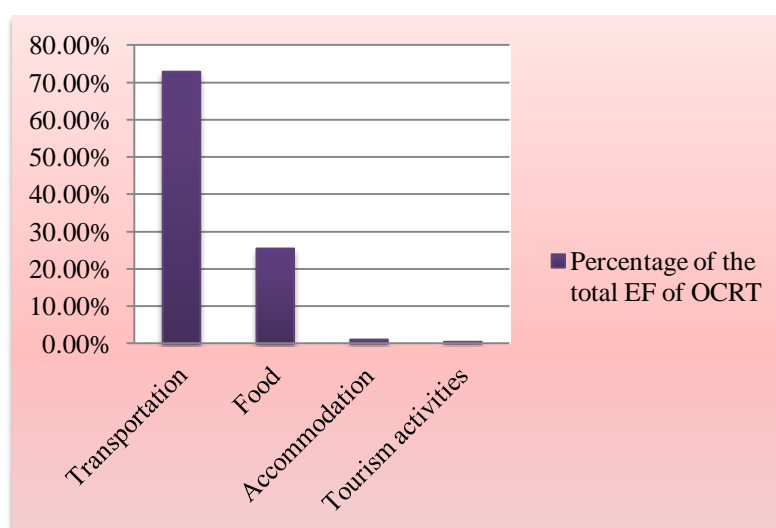


Figure 6.29: Comparison between EFs of Naseby for transportation, food, accommodation services, and visitor activities (2011)

6.1.10. Naseby Overshoot Portion of EF

Table 6.56 compares the present EF of Naseby per visitor and the target EF (0.03gha) investigated in Chapter 5- section 5.9.1. As shown in this table the present EF of Naseby at 0.14 gha/ visitor (see Table 6.55) is 0.11gha/visitor more than the target EF for sustainable living. Furthermore, the overshoot portion of the total EF of 4,645 Naseby visitors as shown in Table 6.56 is $(4,645 \times 0.11) = 511$ gha.

Table 6.56: Overshoot portion of Naseby visitors- EF (gha/visitor/year) (2011)		
Now	Goal	Overshoot EF(gha/visitor/year)
0.14 ¹	0.03 ²	0.11
1. See Table 6.55 2. See Chapter 5-section.5.9.1 and Table s.5.85 - 5.86 • Total overshoot EF(gha) of 4,645 Naseby visitors = $4,645 \times 0.11 = 511$ gha		

6.1.11. Overshoot Portion of Energy Used

6.1.11.1. Overshoot Portion of Energy Use per Visitor

This chapter calculates the overshoot portion of Naseby visitors through using the method explained in Chapter 5- section 5.9.2. As shown in Table 6.56 the EF of Naseby is 0.14 gha/visitor and as a result energy use is equivalent to:

$$0.14 \text{ (gha/visitor)} \times 100 \text{ (carrying capacity of land)} = 14 \text{ (GJ/visitor)}$$

Moreover sustainable energy use per visitor is:

$$0.03 \text{ (gha/visitor)} \times 100 \text{ (carrying capacity of land)} = 3 \text{ (GJ/visitor)}$$

The overshoot portion of Naseby energy use is:

$$14\text{GJ/visitor} - 3 \text{ GJ/visitor} = 11\text{GJ/visitor (Table 6 .57)}.$$

Table 6.57: Overshoot portion of Naseby visitor energy use (GJ/visitor/year) (2011)		
Now	Goal	Overshoot energy use (GJ/visitor/year)
14	3	11

6.1.11.2. Total Overshoot Portion of Energy Used

The total overshoot energy of Naseby visitors can be calculated as the total number of visitors (4,645) multiplied by the overshoot energy use per visitors (11 GJ/visitor/year), which is 51,095 GJ/year (Table 6.58).

Table 6. 58. Total overshoot portion of Naseby visitor energy use (GJ/ year) (2011)

Number of visitors	Overshoot energy use (GJ/visitor/year)	Total overshoot energy use (GJ/year)
4,645	11	51,095

6. 1.11.3. Overshoot Portion of Energy Use by Categories

In this section, the overshoot portion of each category (transportation, food, accommodation and visitor activities) is calculated through using the equation explained in Chapter 5- section 5.9.3. As shown in Table 6.59, transportation uses the majority share of 37,248 GJ/year overshoot energy, followed by food (13,029GJ/year), accommodation services (562GJ/year) and Naseby visitor activities (255 GJ/year).

Table 6.59: Naseby overshoot portion of energy used by categories (2011)

Category	EF (gha) ¹	% of total EF ¹	Overshoot portion of energy use (GJ/year)
Transportation	459.6	72.89	37,243
Food	160.9	25.5	13,029
Accommodation	7.012	1.11	567
Activities	3.02	0.5	255
Total	630.53	100	51,095 ²

1. See Table 6.55
2. See Table 6.58

6.1.12. Economic Footprint of Naseby Rail Trail Visitors

In 2011, the total GDP of the OCRT was NZ\$6,245,289 (see Table 5.90) and GDP per visitor was NZ\$530 (NZ\$6,245,289 ÷ 11,788 OCRT visitors) (Table 6.60). This chapter uses this visitor GDP figure to calculate the GDP of Naseby visitors in 2011. Table 6.60 determines that the total GDP of Naseby rail trail visitors is NZ\$530 (GDP/visitor) × 4,645 (total number of Naseby visitors) = NZ\$2,461,850.

Table 6.60: Naseby GDP (2011)

OCRT total GDP (NZ\$)	OCRT number of visitors	OCRT GDP (NZ\$/visitor)	Naseby number of visitors	Naseby total GDP (NZ\$) ³
6,245,289 ¹	11,788 ²	530	4,645	2,461,850

1. See Table 5.90
2. See Figure 5.2
3. 4,645 × NZ\$530/visitor = NZ\$2,461,850

Table 6.61 shows that the total overshoot energy of Naseby visitors is 51,095 GJ/year. Since the cost to generate 1 GJ through using renewable resources is NZ\$19.8 (see Ta-

ble 5.94), then the total cost that must be paid to generate 51,095 GJ/year is NZ\$1,011,681 (51,095 × NZ\$19.8) (Table 6.61). This means the sustainable portion of Naseby GDP is NZ\$2,461,850 (GDP) – NZ\$ 1,011,681 = NZ\$1,450,169 = 58.9% of the total Naseby GDP (Table 6.61 and Figure 6 .30).

On the other hand the GDPs of Naseby as an ecological-economic indicator indicates that 41.1% (100%-58.9%) of Naseby GDP must be paid to restore its environmental impacts to being ecologically sustainable. In addition, this GDPs as a social-economic indicator evaluates the contribution of the Rail Trail to local economic development, through engagement of local participants and organizations (in this case accommodation services) in the development process.

Total Naseby GDP (NZ\$)	2,461,850 ¹
Overshoot energy use (GJ/year)	51,095 ²
Energy cost (NZ\$/GJ) wind-solar	19.8 ³
Total cost(NZ\$) to generate overshoot portion of Naseby energy by wind-solar systems	1,011,681
GDPs (NZ\$) ¹	1,450,169

1. See Table 6.60
 2. See Table 6.58
 3. See Table 5.94

- GDPs= Total GDP - total cost to generate the overshoot portion of energy use through renewable resources (see Chapter 5- section.5.10.2).

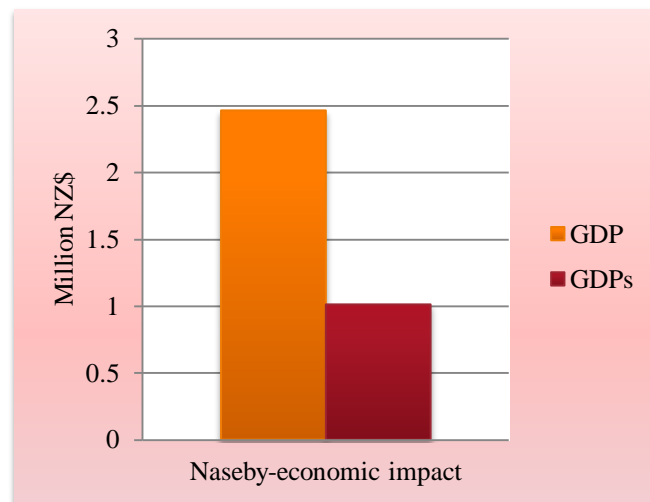


Figure 6.30: Naseby- comparison between GDP and GDPs

6.1.13. Naseby Cultural Footprint (CF)

This thesis uses the CF model explained in Chapter 4 to explore the cultural footprint of the OCRT on Naseby as one of its host destinations. In this case study the CF of the Rail Trail in Naseby is categorised into the three areas of food, accommodation and visitor activities and, as previously explained in Chapter 5 (section 5.11), the CF of transportation is not included in this research.

6.1.13.1. Naseby CF- Food

Table 6.62 contains the summarised results of two proposed scenarios for Naseby food (sections 6.5.1 and 6.5.2). As shown in Table 6.62, the total conventional eaten out food in the first scenario is 30,936kg (100% of food consumed) and in the second scenario it is 30,936kg made up of 27286kg (88.2%) conventional food and 3,650 kg (11.8%) home prepared (organic food). As a result, the total EF of Naseby food in the first scenario is 167.22gha /year and in the second scenario this reduces to 160.9gha/ year (Table 6.62).

Table 6.62 indicates that in the second scenario the overshoot portion of the energy value of the food consumed is equivalent to 13,029 GJ/year. Since the EF of food in the first scenario (EF1) is 6.32 gha bigger than that of the second scenario (EF2), the overshoot energy value of food consumed in the first scenario is 632 GJ ($6.32 \text{ gha} \times 100$ – global average carrying capacity of land). This is bigger than the overshoot portion of the energy value of food in the second scenario (13,029 GJ/year). Consequently the overshoot energy value of food in the first scenario is $13,029 \text{ GJ} + 632 \text{ GJ} = 13,661\text{GJ/year}$ (Table 6.62).

In this section, the overshoot portions of EF1 of 136.61 gha (see Table 6.62) and EF2 of 130.29 gha (see Table 6.62) are calculated using the method explained in Chapter 5-section 5.11.1. As the cost to generate 1GJ energy using wind-solar systems is NZ\$19.8, the cost to generate 13,661 GJ/year (overshoot portion of energy value of food in the first scenario) is $13,661 \text{ GJ} \times \text{NZ\$}19.8 = \text{NZ\$ } 270,488$ (see Table 6.62). Likewise the total cost to generate the overshoot energy using wind-solar systems in the second scenario is $\text{NZ\$}19.8 \times 13,029 \text{ GJ/year} = \text{NZ\$ } 257,974$ (Table 6.62).

The total GDP of Naseby food is calculated using the GDP/kg food of OCRT multiplied by total Naseby food consumed (kg). As the total GDP for food related to the OCRT is NZ\$782,795 (see Table 5.91) and total produced/consumed food is 78,508.45 kg, the GDP of food related to OCRT per kilogram is equal $\text{NZ\$}782,795 \div 78,508.45 \text{ kg} = 9.97 \sim \text{NZ\$}10/\text{kg}$.

In Naseby the total amount of food consumed is 30,936 kg (see Table 6.62). As a result the GDP of Naseby food is equivalent to $30,936 \text{ (kg)} \times \text{NZ\$}10/\text{kg of food} = \text{NZ\$}309,360$ (Table 6.62).

Table 6.62 shows the GDP associated with food for both scenarios is NZ\$309,360. As a result:

$\text{GDPs}_1 = \text{NZ\$}309,360 \text{ (GDP)} - \text{NZ\$}270,488 \text{ (renewable energy cost)} = \text{NZ\$}38,872$;

$\text{GDPs}_2 = \text{NZ\$}309,360 \text{ (GDP)} - \text{NZ\$}257,974 \text{ (renewable energy cost)} = \text{NZ\$} 51,386$.

The difference between GDPs₁ and GDPs₂ shows the NZ\$12,514 contribution to GDPs from producing 3,650 kg home prepared (organic) food by Naseby accommodation services. In addition, it can be considered that producing 1kg home prepared (organic) food contributes NZ\$3.43 to GDPs (Table 6.62).

First scenario (100% conventional food)		Second scenario (88.2% conventional food and 11.8% home prepared (organic) food)	
Total conventional eaten out food (kg)	30,936 ¹	Total conventional eaten out food (kg)	27,286 ¹
Total home prepared food (kg)	0.00	Total home prepared food (kg)	3,650 ¹
Total EF of consumed food gha/year – (EF1)	167.22 ¹	Total EF of consumed food gha – (EF2)	160.9 ¹
Overshoot portion of energy related to food (GJ/year)	13,661	Overshoot portion of energy related to food (GJ/year)	13,029 ²
Overshoot portion of EF1 (gha/year)	136.61	Overshoot portion of EF2 (gha/year)	130.29
Cost to generate 1GJ energy using wind-solar systems (NZ\$)	19.8	Cost to generate 1GJ energy using wind-solar systems (NZ\$)	19.8
Total cost to generate overshoot energy using wind-solar systems (NZ\$)	270,488	Total cost to generate overshoot energy using wind-solar systems (NZ\$)	257,974
Total food GDP (NZ\$)	309,360	Total food GDP (NZ\$)	309,360
Total food GDPs ₁	38,872	Total food GDPs ₂	51,386
1. See Table 6.12 2. See Table 6.59 • Increased portion of GDPs influenced by using 3,650 kg home prepared food = $\text{NZ\$}12,514 = \text{NZ\$}3.43/\text{kg}$			

a. Ideal Sustainable Life Model: Food

Table 6.62 shows that the present EF2 of Naseby food (second scenario) is 160.9 gha and the overshoot portion of EF2 is 130.29 gha. As a result the sustainable EF of Naseby food can be determined through the following equation:

$$160.9 \text{ gha (EF2, present EF)} - 130.29 \text{ gha (overshoot portion of EF2)} = 30.61 \text{ gha}$$

In the ideal model for Naseby tourist related food, since the overshoot portion of energy use is zero, the GDPs is equal to the total GDP of Naseby food (NZ\$309,360, see Table 6.62). This study uses the ideal model of Naseby food and compares it with the two scenarios shown in Table 6.62.

In Figure 6.31, the area of ‘Q1, EF1, and GDPs1’ illustrates ordinary life; this is the area in which all Naseby visitors consume 100% (30,936 kg) conventional eaten out food (first scenario). In this area, development of the Rail Trail (OCRT) does not exert any influence on Naseby (as one of the host destinations) and its visitors to produce and consume local foods. In Figure 6.31 the EF of using 100% conventional food (EF1) is 167.22 gha / year and this represents the total food EF. In the ordinary life area, GDPs1 is equal to NZ\$ 38,872 (see Table 6.62).

Comparison between the first scenario and the ideal model of Naseby food consumption indicates that in the first scenario the EF1 (167.22 gha) is 81.7 % bigger than the ideal EF (30.61 gha) (Figure 6.31 and Table 6.62). Moreover, as shown in Figure 6.31, in the first scenario, GDPs1 is equal to 12.56 % of the total GDP of Naseby food. On the other hand, 87.44% (100%- 12.56%) of total GDP related to the food must be spent to change EF1 to the ideal EF through generating the overshoot portion of food energy by using wind-solar systems.

In Figure 6.31, the area of ‘Q2, EF2, and GDPs2’ determines the CF area of Naseby for producing and consuming home prepared (organic) foods. As demonstrated in Figure 6.31 total Q2 in the CF for food consumed by Naseby visitors (30,936 kg) is divided into the two portions of 11.8% (3,650kg) home prepared food (Q3) and 88.2% (27,286kg) conventional eaten out food (Q 4). The EF in the CF (EF2) contains the EF of using 11.8% (3,650kg) home cooked and 88.2% (27,286 kg) conventional eaten out foods. The GDPs2 in the CF is equal to NZ\$51,386 which is 4% (NZ\$12,514) more than GDPs1 (NZ\$38,872) (Table 6.62).

Figure 6.31 and Table 6.62 indicate that using 11.8% home prepared (organic) food reduces total Naseby food EF by 3.8% (shown in Figure 6.31 as R-EF1). Likewise, as shown in this figure, producing 11.8% local food increases GDPs1 by 4%, shown in the figure as (I) GDPs1.

Comparison between the ideal model and present pattern of Naseby food consumption demonstrates that EF2 (160.7gha) is 77.9 % (130.29 gha) more than ideal EF (30.61 gha), and 83.4 % (NZ\$257,974) of the GDP (NZ\$309,360) of food must be spent to reduce this overshoot portion of EF2 to the ideal EF (Table 6.62 and Figure 6.31).

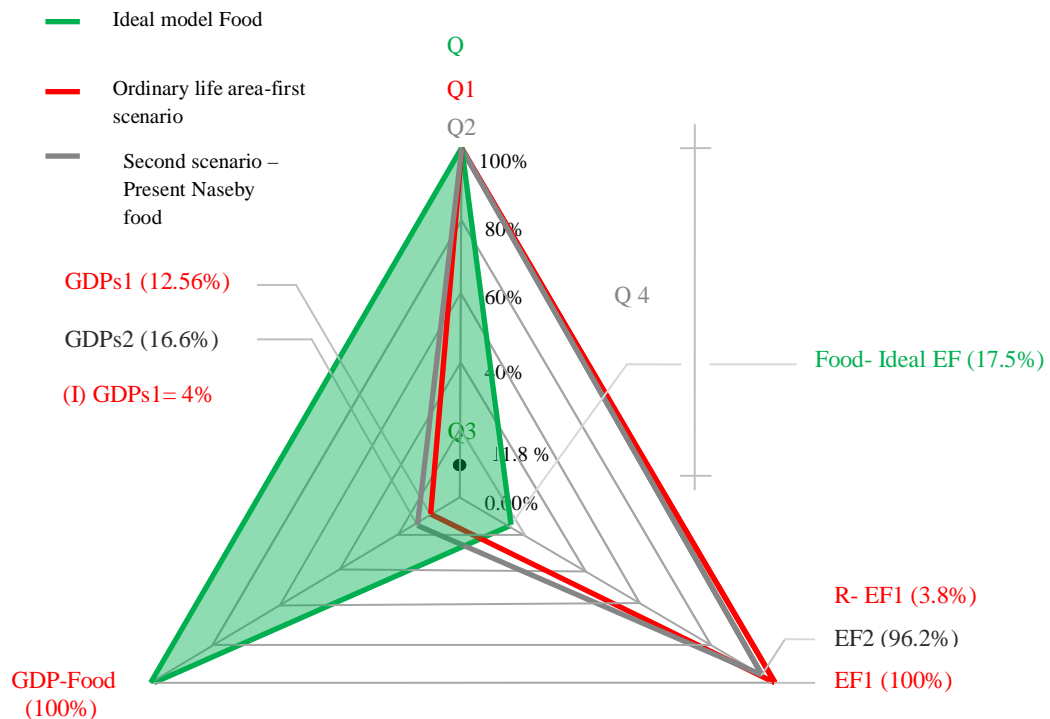


Figure 6.31: The cultural footprint (CF) of Naseby related to food

- Q: 100% food in Ideal model
- Q1: 100% conventional eaten out food – first scenario
- Q2: 88.2% conventional eaten out food + 11.8% home prepared food - second scenario
- Q3: 11.8% home prepared food (second scenario)
- Q4: 88.2% conventional eaten out food (second scenario)
- GDPs1: sustainable portion of GDP – first scenario
- GDPs2: sustainable portion of GDP – second scenario
- (I) GDPs1: increased portion of GDPs1
- EF1: ecological footprint of consumed food - first scenario
- EF2: ecological footprint of consumed food - second scenario
- R- EF1: reduced portion of total EF1 of consumed food

6.1.13.2. Naseby CF: Accommodation Services

This thesis explores the CF of 98 Naseby accommodation services through three scenarios based on different quantities and qualities of accommodation services, their EFs and

related GDPs values. In the first scenario, all buildings used as accommodation services are assumed to be newly constructed (NB) without open air areas (veranda and balcony). In the second scenario 6.1% (6) of 98 Naseby accommodation buildings with an area of 2,183m² area are RB and 93.9% (92) with an area of 5,961m² are NB. In addition in the second scenario all areas of buildings including indoor and outdoor (V/B) spaces are calculated as indoor spaces. In the third scenario 93.9% of 98 buildings are NB, 6.1% of buildings are RB and 100.1m² of total building area is outdoor sitting space (V/B) (Table 6.64).

Table 6.63 shows that in the first scenario the total EF of using 100% NB buildings as accommodation services is 7.6 gha. In this Chapter, the GDP of Naseby's accommodation services is calculated through the following equations:

$$\text{GDP of OCRT/visitor nights} = \frac{2,837,412 \text{ (total GDP of OCRT, see Table 5.91)}}{42,437 \text{ (total OCRT visitor nights, see Table 5.9)}} = \text{NZ\$ } 66.86 \text{ per visitor night}$$

$$\text{GDP of Naseby accommodation services} = \text{NZ\$}66.86/\text{visitor night} \times 16,722 \text{ (Naseby visitor nights, see Table 6.9)} = \text{NZ\$}1,118,033 \text{ (Table 6.63)}.$$

Since the overshoot portion of energy use in the third scenario has already been calculated as 567 GJ (see Tables 6.63 and 6.59), it is used here as a base to calculate the overshoot energy of the first and second scenarios through the method which has been explained in Chapter 5-section-5.11.2. Table 6.64 shows that the overshoot portions of energy for accommodation services in the first and the second scenarios are 625.8 GJ and 575.8 GJ respectively.

Table 6.63 contains the total costs to generate the overshoot energy related to each of the three scenarios. These costs are calculated through using the method explained in Chapter 5-section.5.11.2. As shown in Table 6.63, the costs to generate the overshoot energy of the first, second and third scenarios in an environmentally sustainable way are NZ\$12,391, NZ\$11,401 and NZ\$ 11,227 respectively.

In this section, the GDPs of the three scenarios cited in Table 6.63 are calculated based on the method used in Chapter 5-section.5.11.2 for the GDPs of OCRT accommodation

services. Table 6.63 determines that the GDPs of the third scenario (GDPs3) is the largest at NZ\$1,106,806 followed by NZ\$1,106,632 (GDPs2) and NZ\$1,105,642 (GDPs1).

Table 6.63: Naseby Accommodation services CF (2011)

First scenario		Second scenario		Third scenario	
All Naseby accommodation buildings are NB		93.9 % of 98 Naseby accommodation buildings are NB and 6.1 % are RB (V/B not considered)		93.9% of 98 buildings are NB and 6.1% are RB including 100.1m ² V/B	
Total number of accommodation services	98 ¹	Total number of accommodation services	98	Total number of accommodation services	98
NB accommodation area (m ²)	8,144 ²	NB accommodation area (m ²)	5,961 ²	NB accommodation area (m ²)	5,961 ²
RB accommodation area (m ²)	0.00	RB accommodation area (m ²)	2,592 ²	RB accommodation area (m ²)	2,592 ²
Total EF (EF1) (gha)	7.6 ³	Total EF (EF2) (gha)	7.1 ⁴	Total EF (EF3) (gha)	7.012
GDP (NZ\$)	1,118,033	GDP (NZ\$)	1,118,033	GDP (NZ\$)	1,118,033
Overshoot energy (GJ/year)	625.8	Overshoot energy (GJ/year)	575.8	Overshoot energy (GJ/year)	567
Cost to generate 1 GJ energy using wind-solar systems (NZ\$)	19.8	Cost to generate 1 GJ energy using wind-solar systems (NZ\$)	19.8	Cost to generate 1 GJ energy using wind-solar systems (NZ\$)	19.8
Cost to generate 625.8 GJ energy using wind-solar systems (NZ\$)	12,391	Cost to generate 575.8 GJ energy using wind-solar systems (NZ\$)	11,401	Cost to generate 567GJ energy using wind-solar systems (NZ\$)	11,227
GDPs1	1,105,642	GDPs2	1,106,632	GDPs3	1,106,806
1. See Table 5.15 2. See Table 5.23 3. See Table 5.36 4. See Table 5.37					

a. Sustainable living OCRT Accommodation Services (Ideal Model)

This section determines an ideal model for Naseby accommodation services in which its EF is considered environmentally sustainable and its GDPs is equal to the total GDP of Naseby accommodation services. This model is then used to compare each of the three scenarios for Naseby accommodation services (cited in Table 6.63) with an environmentally and economically sustainable pattern of accommodation.

a.1. Sustainable EF

As shown in Table 6.63 the total overshoot energy of Naseby accommodation services at present is 567 GJ/year. As a result the overshoot portion of its EF is $567/100 = 5.67$ gha. As indicated in Table 6.63, the present EF of Naseby is 7.012 gha (EF3). Consequently the environmentally sustainable EF can be considered as $7.012 \text{ gha} - 5.67 = 1.34 \text{ gha}$.

a.2 . Sustainable Living: GDPs

Since for sustainable living the EF of accommodation services is not in overshoot, consequently in this position both the overshoot energy and the cost to generate this through using wind-solar systems are zero. Consequently the GDPs of the Ideal Model is equal to the total GDP of Naseby accommodation services (NZ\$1,118,033, see Table 6.63).

b. Comparison between the Ideal Model, First and Second Scenarios

Figure 6.32 comprises the quantities, EFs and GDPs(s) of Naseby accommodation services arising from the Ideal model, first, second, and third scenarios discussed above. This figure makes this an opportunity to explore the ecological and economic influences exerted by using 2,183 m² (26.8% of the total 8,144 m², see Table 6.19) of accommodation area as refurbished (RB) buildings on the host destination.

As shown in Figure 6.32, in the Ideal model of accommodation services, Q is the 100% Naseby accommodation services area (8,144 m²) with an EF of 1.34 gha and GDPs of NZ\$1,118,033 GDPs. In the ideal model as discussed above, the overshoot portion of the EF and energy use are equal to zero. In first scenario, Q1 is the total area of Naseby accommodation services (8,144 m²) where 100% are assumed to be new buildings (NB) (Figure 6.23). In the second scenario as illustrated in Figure 6.32, Q2 represents the Naseby accommodation area (8,144m²) divided into two portions of 73.2% (5,961m², see Table 6.19) NB and 26.8% (2,183 m², see Table 6.19) RB buildings.

In Figure 6.32, EF1 is the biggest EF in comparison with the EFs of the other scenarios and is here considered to be the 100% value. In addition, in this figure, the percentages of other EFs including EF2 and Ideal- EF are compared with EF1 as the 100% benchmark.

As shown in Figure 6.32, in the ideal model of Naseby accommodation services, the acceptable EF of these services is 17.6% of EF1 (7.6gha, see Table 6.63). On the other hand, in the first scenario in which all accommodation is assumed to be NB, the EF (EF1= 7.6gha) is 82.4% (6.26gha) larger than the sustainable EF (1.34gha) (Figure 6.32).

As illustrated in Figure 6.32, the EF of Naseby accommodation services in the second scenario ($EF_2 = 7.1$ gha, see Table 6.64) is 93.4% of EF_1 (7.6gha, see Table 6.63). Consequently (R) EF_1 is equal to 6.6% of $EF_2 = 0.5$ gha (Figure 6.23).

GDPs1 (GDPs of the first scenario = NZ\$ 1,105,642) is equal to 98.9% of total GDP of Naseby -accommodation services (NZ\$ 1,118,033) (Figure 6.32). On the other hand, in the first scenario 1.1% (NZ\$12,298) of the total GDP of Naseby accommodation services must be spent to generate the overshoot portion of accommodation energy use through wind-solar systems to change EF_1 to the ideal EF.

As shown in Figure 6.32, GDPs2 (NZ\$1,106,632, the GDPs of the second scenario) is 99% of the total GDP of Naseby accommodation (NZ\$1,118,033). On the other hand in the second scenario 1% (NZ\$11,180) of the total GDP of Naseby accommodation services must be spent to generate the overshoot portion of associated energy use through using wind-solar systems to reduce EF_2 to the ideal EF. Likewise, as determined in Figure 6.32, (I) GDPs1 is equal to 0.1% of the total GDP of Naseby accommodation services. This means using 2,183 m² RB (26.8% of total Naseby accommodation areas) contributes to an increase of 0.1% of GDPs1.

c. Comparison between the Ideal Model, Second and Third Scenarios

In third scenario Q3 is total area of Naseby accommodation services in which 73.2% (5,961m²) is NB and 26.8% (2,183m²) is RB (Figure 6.32 and Table 6.63). Furthermore, in the third scenario, of total Q3 (8,144 m²) 100.1m² (1.2%) is V/B and 8,043.9 m² (98.8%) is indoor spaces (Figure 6.32).

In the third scenario, the total EF of Naseby accommodation services (EF_3) is 7.012 gha (see Table 6.63), which is 92.3% of EF_1 (Figure 6.32). In addition, as shown in Figure 6.32, EF_3 (92.3 % of EF_1) is 1.1% less than EF_2 (93.4% of EF_1). On the other hand (R) EF_2 is equivalent to $(EF_2) - (EF_3) = 1.1\%$ of EF_1 (EF of the first scenario that is used as a base, representing the 100% EF of Naseby accommodation services). Thus EF_3 is the present EF of Naseby accommodation services, which is 74.94% (92.3%- 17.36%) bigger than the Ideal EF shown in Figure 6.32.

Figure 6.32 and Table 6.63 show that the GDPs of the third scenario (GDPs3), which is the present GDPs of Naseby accommodation services, is 0.01% more than GDPs2. Fur-

thermore, GDPs3 is 1.01% (NZ\$11,292) less than the total GDP (NZ\$1,118,033) of Naseby accommodation services (Figure 6.32 and Table 6.63). This means (I) GDPs2 which is influenced by using 100.1m² V/B is 0.01% of the total GDP of Naseby accommodation services. In addition, Figure 6.23 shows that in the third scenario (present circumstance of Naseby accommodation services), 1.01% (NZ\$11,292) of the GDP of Naseby accommodation services must be spent to generate its overshoot portion of energy use through using wind-solar systems to reduce its present EF to the ideal EF.

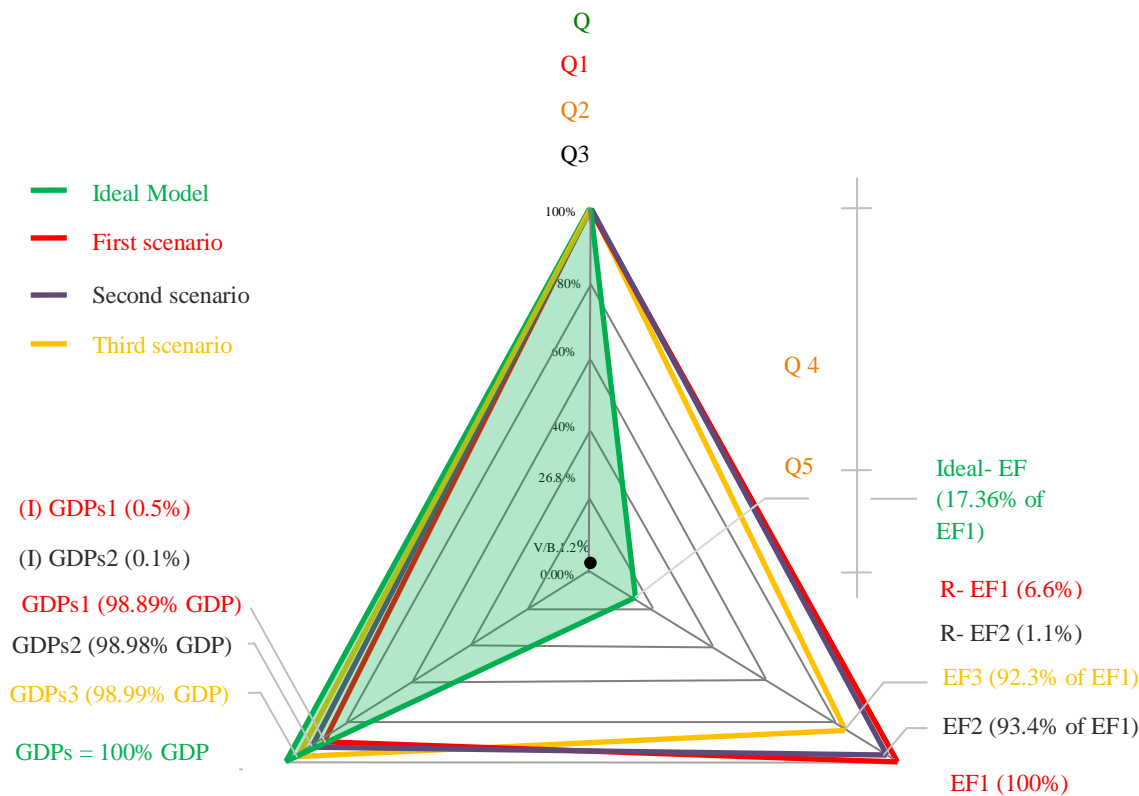


Figure 6.32: The CF of Naseby accommodation services using RB buildings and V/B as part of accommodation services

- Q: (100%) area of 98 Naseby accommodation services (8,144m²) – Ideal model
- GDP: GDP of Naseby-accommodation services NZ\$1,118,033 (see Table 6.62)
- GDPs: Total sustainable portion of Naseby accommodation services – Ideal model
- Q1: Total (100%) area of 98 Naseby accommodation services (8,144m²) – all assumed as NB (first scenario)
- EF1: Total EF of Naseby accommodation services (first scenario)
- (R) EF1: Reduced portion of Naseby EF1 influenced by using RB buildings as accommodation services.
- GDPs1: Total GDPs of Naseby accommodation services (first scenario)
- (I) GDPs1: Increased portion of GDPs1 influenced by using RB as part of Naseby accommodation services
- Q2: Area 98 Naseby accommodation services (8,144m²) including; 73.2% (5,961m²) NB and 26.8% (2,183m²) RB (second scenario)
- Q3: Area of 98 Naseby accommodation services (8,144m²) including; 73.2% (5,961m²) NB and 26.8% (2,183m²) RB. Of total Q3 (8,144m²), 100.1m² (1.2%) is V/B and 8,043.9 m² is indoor spaces (third scenario)

- Q 4 (NB area): 73.2% (5,961m²) of total Naseby accommodation area (8,144m²) (second scenario)
- Q5 (RB area): 26.8% (2,183m²) of total Naseby accommodation area (8,144m²) (second scenario)
- EF2: EF of 8,144 m² Naseby accommodation services (Q2) including EFs of Q3 and Q 4
- (R) EF2: Reduced portion of Naseby EF2 influenced by using V/B
- GDPs2: Total GDPs of Naseby accommodation services (second scenario)
- EF3: EF of Naseby accommodation services (third scenario) (present EF of accommodation services)

6.1.13.3. The CF of Naseby Visitor Activities

a. Overshoot EF of Naseby Visitor Activities

As shown in Table 6.64, the category of other activities has the largest portion at 71% (2.13gha) of the total EF of Naseby visitor activities (3.02 gha), followed by curling (23%), golf (0.18%) and walking (0.05%). Table 6.64 shows that the total overshoot portion of the EF of Naseby activities is 2.55 gha (see also Table 6.59). The overshoot portions of the EFs of the four activity groups above are calculated as follows:

Overshoot portion of the EF of each activity category = the activity percentage of the EF × total overshoot EF of Naseby activities (2.55 gha)

For example:

Overshoot EF of golf = 6% × 2.55(gha) = 0.15 gha (see Table 6.64).

In addition the overshoot energy use of each category is calculated as its overshoot EF × 100 (global average carrying capacity) (Table 6.64). As shown in Table 6.64, the category of other activities has the largest overshoot energy of 180 GJ, followed by 59 GJ curling, 15 golf and 0.1GJ walking.

b. Naseby Activities GDP

This chapter uses the average GDP of OCRT activities per visitor (NZ\$56.88) cited in Chapter 5- Table 5.98 as Naseby GDP per visitor activity (Table 6.64). As shown in Table 6.64 the GDP of each category is calculated as the number of visitor activities × NZ\$56.88/visitor activity. Table 6.64 demonstrates that of the NZ\$744,446 GDP of Naseby activities (13,088 visitor activities × NZ\$56.88 GDP/visitor activity), the largest portion of NZ\$492,012 is the GDP of other visitor activities, followed by NZ\$247,428 (curling), NZ\$ 3,413 (golf) and NZ\$1,593 walking.

c. Naseby Activities GDPs

As demonstrated in Table 6.64 the overshoot energy use of each category is calculated as its overshoot EF multiplied by 100 GJ/gha (global average carrying capacity of land).

Also as shown, the category of other activities the largest overshoot of 180 GJ, followed by curling (59 GJ), golf (15) and walking (0.1GJ).

This chapter calculates the cost to generate the overshoot portion of the energy of each category of Naseby activities through using the method explained in Chapter 5- section 5.10.2. Table 6.64 contains the total cost that must be paid to generate the overshoot energy of each type of Naseby activity through using wind-solar systems. As presented in Table 6.64, the category of other activities has the largest cost of NZ\$ 3,510 and walking the minimum cost (\$NZ2 ~ 0.00) to generate the overshoot energy in a sustainable way. The total cost of Naseby activities overshoot energy as shown in Table 6.64 is \$NZ4, 948.

The GDPs of each category of Naseby visitor activities (GDP – cost of overshoot energy used) are set out in Table 6.64. As shown, the GDPs of the category of activities has the largest GDPs of NZ\$ 488,502 and other activities including curling, golf and walking have the GDPs in a range of NZ\$1,591 – NZ\$246,277. In addition, the total GDPs of Naseby visitor activities is NZ\$739,498, equivalent to 99.33% of its total GDP (\$NZ744, 446) (Table 6.64).

Table 6.64: Naseby visitor activities- EF and GDPs

Category	Number of visitors/activity	EF ¹ (gha)	% ⁴	Overshoot EF (gha) ²	Overshoot energy (GJ) ²	GDP (NZ\$) ²	Cost of overshoot energy (NZ\$) ²	GDPs (NZ\$)
Golf	60	0.18	6	0.15	15	3,413	285	3128
Curling	4,350	0.7	23	0.59	59	247,428	1,151	246,277
Walking	28	0.0014	0.05	0.001	0.1	1,593	2	1,591
Other	8,650	2.13	71	1.8	180	492,012	3,510	488,502
Total	13,088	3.02	100	2.55 ³	255	744,446	4,948	739,498

1. See Figure 6.27 and Table 6.55

2. Numbers are rounded

3. See Table 6.59

4. percentages are rounded

• Average GDP of OCRT visitor activity = Total GDP of OCRT activities/visitor activities = 1483,180 ÷ 26,077 = NZ\$56.88 (see Chapter 5: Table 5.98).

d. CF: Ideal Model for Sustainable Activities and Three Scenarios

This chapter proposes three scenarios for the CF of Naseby visitor activities (illustrated in Figure 6.33) and compares the areas generated with each other and the sustainable area (Ideal model) of these activities (shown as the green area in Figure 6.33).

d.1. Naseby Visitor Activities (Ideal model)

This thesis considered the sustainable area for ecotourism activities to be the area in which the overshoot portion of the EF of activities is zero and consequently the GDPs of this area is equal with the total GDP arising from these activities under that constraint.

As shown in Table 6.64, the present EF of Naseby visitor activities is 3.02 gha and its overshoot EF is 2.55 gha. The EF of the Ideal model for Naseby visitors activities (zero overshoot EF) is $3.02\text{gha} - 2.55\text{gha} = 0.47\text{gha}$. This means the ecologically sustainable EF of Naseby visitors activities (0.47 gha) is 15.6 % of its present EF (EF1= 3.02gha). Moreover, in the sustainable area of Naseby visitors activities, as the cost of overshoot energy is zero, its GDPs is equal to 100% of the GDP of Naseby visitor activities (\$NZ744,446, see Table 6.64).

d.2. Naseby Visitor Activities (First Scenario)

The present CF of Naseby visitor activities is the same as the first scenario shown in Figure 6.33. In the first scenario the total number of visitor activities (13,088) comprises 8,650 visitors doing other activities, 4,350 visitors curling, 60 visitors playing golf, and 28 visitors walking (see Table 6.65). (Note: the number of activities is greater than the number of visitors to Naseby, as each visitor is assumed to participate in more than one activity).

The total EF of Naseby visitors' activities (EF1) in the first scenario is 3.02 gha (see Table 6.65) and this is used as the 100% benchmark when comparing this with other scenarios and the Ideal model (see Figure 6.24). As shown in Figure 6.33 and Table 6.64 in the first scenario GDPs₁ (present situation, Table 6.64) is equal to 99.33% (NZ\$739,498) of the total GDP of Naseby visitor activities (NZ\$744,446).

d.3. OCRT Visitor Activities (Second Scenario)

The second scenario is proposed based on the assumption that the 60 visitors who play golf in the first scenario choose walking instead (see Table 6.65). In the second scenario, walking is assumed to have an EF of 0.00006gha/visitor, see Table 5.82).

Table 6.65: The CF of Naseby visitor activities - first and second scenarios

Table 6.65: The CF of Naseby visitor activities - first and second scenarios							
First scenario				Second scenario			
Category	NV ⁴	EF/visitor	EF1	Category	NV	EF (gha/visitor)	EF2 (gha)
Golf	60	0.003 ¹	0.18	-	-	-	-
Curling	4,350	0.00016 ²	0.7	Curling	4,350	0.00016 ²	0.7
Walking	28	0.00005 ³	0.0014	Walking	88	0.00005 ³	0.0044
Other	8,650	0.00025	2.13	Other	8,650	0.00025	2.13
Total	13,088	-	3.02	Total	13,088	-	2.83

1. See Table 5.58
2. See Table 6.35
3. See Table 5.56
4. NV: Number of visitor activities (see Table 6.64)

As shown in Table 6.65 and Figure 6.33 in comparison with the first scenario, in the second scenario the EF2 is reduced by 0.19 gha compared to EF1 (3.02 gha), a 6.3 % reduction just from 60 visitors changing their activity from golfing to walking. In addition, the overshoot portion of the EF of Naseby activities that in the first scenario is 2.55 gha (see Table 6.64) in the second scenario is reduced to (2.55 gha – 0.19 gha) 2.36 gha. As a result the overshoot energy of Naseby activities in the second scenario is 2.36 gha × 100 (carrying capacity of land) = 236 GJ. Moreover, the total cost to generate the overshoot energy of Naseby visitor activities in the second scenario is:

236 GJ (overshoot portion of energy) × NZ\$19.8 (cost to generate 1GJ energy using wind-solar systems) = NZ\$ 4,672.

Since the total GDP of Naseby visitor activities is NZ\$744,445 (Table 6.64), the GDPs of the second scenario is NZ\$744,446 (GDP) - NZ\$4,672 (the total cost to generate overshoot energy in the second scenario) = NZ\$739,773 = GDPs2. As shown in Figure 6.33, GDPs2 is 99.37 % of the total GDP of Naseby visitor activities (NZ\$744,445) and (I) GDPs2 is GDPs2 (NZ\$739,733) – GDPs1 (NZ\$ 739,498) = NZ\$ 276 = 0.04 % of GDP (NZ\$744,446) .

d.4. Comparison between Ideal Model and First and Second Scenarios

In comparison with the EFs of the two scenarios (EF1 and EF2), the EF of the Ideal model (0.47gha, see section 6.13.3.4-a) is 15.56 % of EF1 (3.02gha) and 16.60 % of EF2 (2.83 gha, see Table 6.65) (Figure 6.33). The proposed CF model in Figure 6.33 determines that for changing EF1 (3.02 gha) to the ideal EF (0.47gha), 0.66 % (NZ\$ 4984) of the total GDP of Naseby visitor activities must be spent to generate the overshoot portion of its energy. Likewise the model (Figure 6.33) indicates that for changing the EF of Naseby visitor activities in the second scenario (EF2) to a sustainable EF,

0.62% (NZ\$ 4,672) of the total GDP of Naseby visitor activities (NZ\$744,446) must be spent to reduce the environmental impact.

d.5. Naseby Visitor Activities (Third Scenario)

The third scenario is proposed based on the assumption that 60 visitors who play golf and 4,350 visitors who play curling in the first scenario (see Table 6.65) choose walking as their activity instead (see Table 6.66).

As shown in Table 6.66 and Figure 6.33, in comparison with the first scenario, in the third scenario, the EF3 is reduced by 77.81% (2.35 gha) compared to EF1. Furthermore, the difference between EF2 and EF3 (2.83 – 2.35= 0.48gha) that is equal to 15.9 % of EF1 (100% of EF) determines the reduced portion of EF2 influenced by changing curling and golfing for walking at Naseby. This portion (15.9 %) is shown as (R) EF2 in Figure 6.33. In addition, the overshoot portion of the EF of Naseby activities that in the first scenario is 2.55 gha (see Table 6.63) in the third scenario is reduced to (2.55 gha – 0.48 gha) 2.07 gha. As a result the overshoot energy use of Naseby activities in third scenario is equal to 2.07 gha × 100 (carrying capacity of land) = 207 GJ. In addition, the total cost to generate the overshoot energy used in third scenario is equal to:

207 GJ (overshoot portion of energy use) × NZ\$19.8 (the cost to generate 1GJ energy using wind-solar systems) = NZ\$ 4,098.

Since the total GDP of Naseby visitor activities is NZ\$744,446 (see Table 6.63) consequently, the GDPs of the third scenario is NZ\$744,446 (GDP) - NZ\$ 4,098 (the total cost to generate overshoot energy in the third scenario) = NZ\$740,348 = GDPs3. As shown in Figure 6.33, GDPs3 is 99.45 % of the total GDP of Naseby visitors activities and (I) GDPs3 is GDPs3 – GDPs2 = 0.08 % of GDP (NZ\$744,445) = NZ\$ 615.

d.6. Comparison between the Ideal Model and the Third Scenario

As Figure 6.33 illustrates, the EF of the Ideal model (1.04 gha, see section 6.13.3.4-a) is equal to 44.8 % of EF3 (2.32 gha, see Table 6.66). The proposed CF model in Figure 6.33 determines that for changing EF3 (2.35gha) to the ideal EF (0.47 gha),0.55 % (\$NZ4,098) of the total GDP of Naseby visitor activities must be spent to generate the overshoot portion of its energy.

Table 6.66: The CF of Naseby visitor activities - first and third scenarios

First scenario			Third scenario				
Category	NV ⁴	EF/visitor	EF1	Category	NV	EF (gha/visitor)	EF3 (gha)
Golf	60	0.04 ¹	0.18	-	-	-	-
Curling	4,350	0.00016 ²	0.7	-	-	-	-
Walking	28	0.00005 ³	0.0014	Walking	4,438	0.00005 ³	0.22
Other	8,650	0.00025	2.13	Other	8,650	0.00025	2.13
Total	13,088	-	3.02	Total	13,088	-	2.35

1. See Table 5.58
2. See Table 6.35
3. See Table 5.56
4. NV: Number of visitor activities (see Table 6.62)

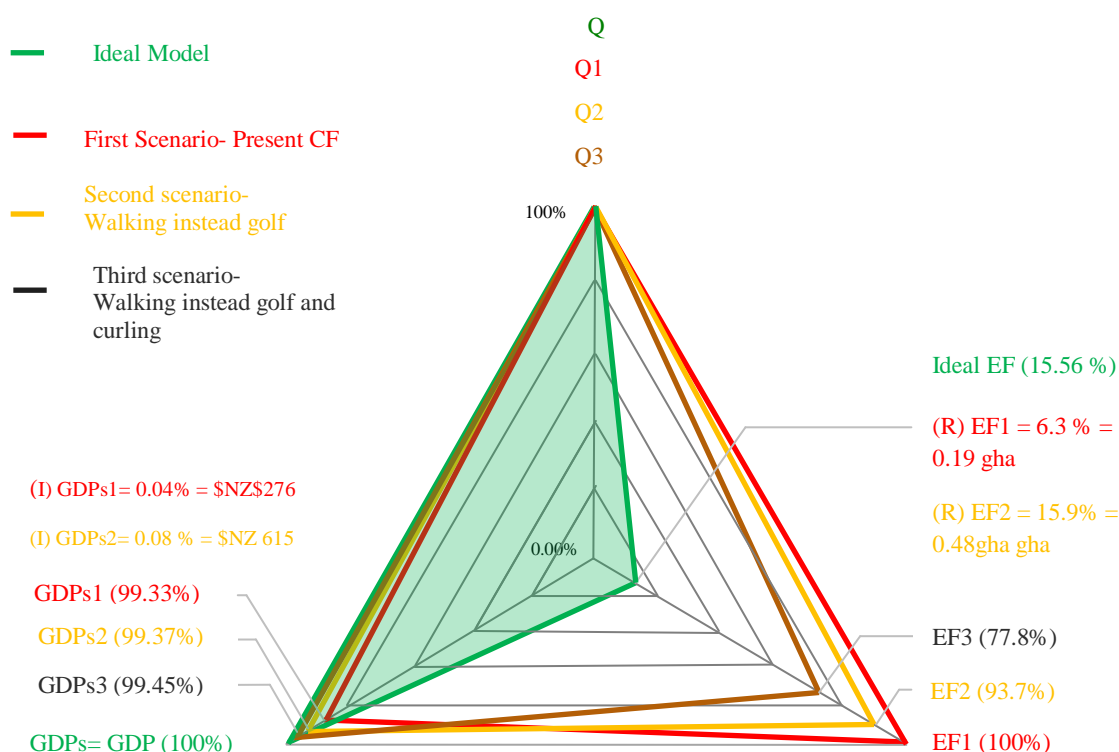


Figure 6.33: The CF of Naseby visitor activities

- Q: 100% of Naseby visitor activities in Ideal model
- Q1: 100% of Naseby visitor activities first scenario (present)
- Q2: 100% of Naseby visitor activities second scenario (Walking instead golfing)
- Q3: 100% of Naseby visitor activities Third scenario (Walking instead golfing and curling)
- EF1: The EF of Naseby visitor activities first scenario (present EF)
- EF2: The EF of Naseby visitor activities second scenario
- EF3: The EF of Naseby visitor activities third scenario
- (R) EF1: Reduced portion of EF1 influenced by changing golf for walking
- (R) EF2: Reduced portion of EF2 influenced by changing golfing and curling for walking
- GDP: The GDP of Naseby visitor activities
- GDPs: The GDPs of Ideal model for visitor activities = GDP
- GDPs1: The GDPs of Naseby visitor activities first scenario
- GDPs2: The GDPs of Naseby visitor activities second scenario
- GDPs3: The GDPs of Naseby visitor activities third scenario
- (I) GDPs 1: Increased portion of GDPs1 influenced by changing golf for walking
- (I) GDPs 2: Increased portion of GDPs2 influenced by changing golf and curling for walking

6.2. Case Study 3: Cromwell

6.2.1. Introduction

This thesis is based on Cromwell as a host destination for OCRT visitors with the intention of comparing the results of the analysis with those of Naseby. As discussed in Chapter 3 (section 3.3.2.3) one of the main reasons for choosing Cromwell as a case study is that new buildings form 100% of accommodation services in this place. Furthermore, due to the existence of environmental attractions and tourism activities in Cromwell, in 2011 22% of 11,788 OCRT people visited this place. These characteristics of Cromwell and its differences from Naseby show how the proposed comprehensive framework can be used to compare the influences exerted by ecotourism and its architecture on different destinations in terms of being sustainable.

This section aims to investigate the influences exerted by ecotourism on the socio-cultural behaviours of visitors and host communities that in turn could change their environmental and economic footprint to being sustainable. The investigation of the influences of the OCRT and its architecture on Cromwell is conducted through using the method and holistic framework explained and used in the first and the second case studies.

6.2.2: Background to Cromwell

Cromwell is a town located at an elevation of 199 m, 45° S and 169° E. The town is strategically placed as a holiday centre for the whole of Central Otago. On the shores of Lake Dunstan, Cromwell's centrality to Wanaka (55km), Queenstown (62km) and the remainder of Central Otago makes it a great location for easy day trips to all corners of Central Otago (see Figures 6.34 and 6.35).

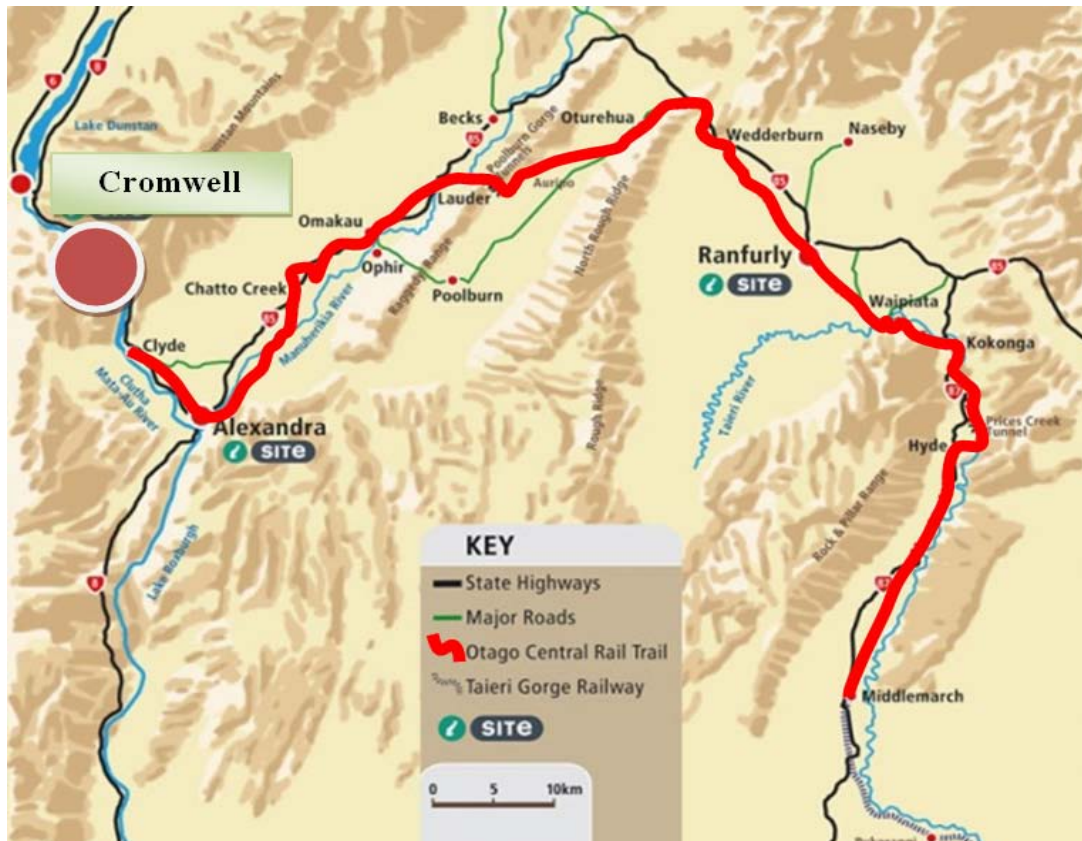


Figure 6.34: Cromwell, Central Otago, New Zealand
<http://www.centralotagoz.com/PicsHotel/CentralOtagoRTO/Images/Discovery/RailTrail/HotspotMap.jpg> viewed August 2012



Figure 6.35: A view of Cromwell
<http://cromwellsports.files.wordpress.com/2010/05/cromwell.jpg> viewed August 2012

As pointed out in the Cromwell Community Plan (2008:8), Cromwell had its beginnings in 1862 when two miners, the American Horatio Hartley and the Irishman Christopher Reilly, took to Dunedin 87lbs (about 40kg) of gold they had recovered from a spot about a mile below the junction of the Kawarau and Clutha Rivers.

Furthermore, Cromwell was the host destination for Chinese miners who began to arrive in 1866 (see Figure 6.36). Emmitt (2010:1) describes how the Chinese miners who landed in Dunedin between 1868 and 1900 were engaged by the Otago Provincial Council. The latter body had made overtures in the Victorian gold fields for people to come and work in the Otago gold fields. Emmitt (2010:1) points out that Cromwell's Chinatown was continuously occupied for more than fifty years and more than 400 Chinese lived in the settlement between 1866 and 1920, when it was finally abandoned.



Figure 6.36: Cromwell Chinese miners

<http://www.cromwell.org.nz/gfx/popup/chinese.jpg> viewed August 2012

The construction of the Clyde Dam (see Figure 6.37) and subsequent filling of Lake Dunstan in the 1980s (Cromwell Community Plan, 2008:8) caused major changes to Cromwell. Many of its historic places like its gold mining heritage (built between 1866 and 1920) and acres of orchards disappeared under water.



Figure 6.37: The Clyde Dam

<http://www.niwa.co.nz/sites/default/files/imported/attachments/92967/Clyde-Dam.jpg>
viewed August 2012

Since the Clyde Dam development policies involved the destruction of Cromwell historic heritage, by early 1985 a group of concerned residents came together to try and save its valuable heritage. As a result, ‘Save Old Cromwell’ was born and an autonomous voluntary Incorporated Society formed, with its board managing the activities (see www.cromwell.org.nz). Initially, eight buildings were chosen from the old commercial area due to be submerged by the advent of the new hydro lake. These buildings were to be relocated further up the main street to a site above the new lake level. This was the origin of the area today known as ‘Old Cromwell Town’ (see Figures 6.38 and 6.39).



Figure 6.38: Old Cromwell Town

<http://oldcromwelltown.files.wordpress.com/2012/02/old-cromwell-cavalcade.jpg>
viewed August 2012



Figure 6.39: Old Cromwell Town

http://farm3.staticflickr.com/2449/4065341439_ce1516df36_z.jpg?zz=1
viewed August 2012

Although the construction of the Clyde dam damaged many of the Cromwell’s natural and cultural heritages, since the 1980s the town has entered a new era of vitality and growth. The shorelines of the Clyde Dam and its two rivers make a destination for holiday makers. In addition, Cromwell has since become the fruit and wine centre of the South Island (see Figure 6.40).



Figure 6.40: Cromwell - fruit picking

<http://img.scoop.co.nz/stories/images/0903/a3c9ec856fb8af54f8b9.jpeg> viewed August 2012

Cromwell with its historic and environmental heritage and capitals is considered one of the attractive destinations for a holiday as offered by the OCRT to its visitors. The following section, therefore, explores the environmental, cultural and economic influences of the development of the OCRT on Cromwell, through using the holistic framework proposed in Chapter 5 for the development of ecotourism and its architecture.

6.2.3: Visitors to Cromwell

In this chapter Cromwell’s visitors are classified into international and domestic visitors. This section presents information related to each group, including the number of visitors, visitor nights and their home places.

6.2.3.1: Visitor Numbers

As shown in Table 5.49 (Chapter 5, 5.7.4) of 11,788 total OCRT visitors, 22.5% (2,652) choose Cromwell as their destination. This chapter therefore uses the 2,652 OCRT visitors to Cromwell as its total number of visitors in 2011, as shown in Table 6.67. Moreover, as shown in Figure 5.7 (Chapter 5), in 2011 the average stay of OCRT visitors is 3.6 nights. This section calculates total visitor nights at Cromwell based on its 2,652 visitors and 3.6 average visitor nights (2,652 visitors × 3.6 visitor nights) to be 9,547 (Table 6.67).

Table 6.67: Cromwell visitors based on CODC survey (2011)

Total numbers of OCRT visitors ¹	% of OCRT visitors who visit Cromwell ²	Numbers of OCRT visitors who visit Cromwell ²	Average visitor nights ³	Total visitor nights
11,788	22.5	2,652	3.6	9,547

1. See Figure 5.2
 2. See Table 5.49
 3. See Figure 5.3

6.2.3.2: Visitors Home Place

As illustrated in Figure 5.13 (Chapter 5, 5.3.3) 22% of the total 11,788 OCRT visitors are international and 78% are domestic. This thesis uses these proportions to calculate the number of visitors in each category to Cromwell as shown in Table 6.68. Table 6.68 determines that the total for domestic visitors to Cromwell is 78% of 2,652 or 2,069 visitors. Likewise, Table 6.68 indicates that 22% (583) of Cromwell’s 2,652 visitors are international in 2011.

Table 6.68: Cromwell international and domestic visitors (2011)

Domestic visitors		International visitors	
Number of visitors	% of total number of visitors	Number of visitors	% of total number of visitors
2,069	78	583	22

• Cromwell total visitors (2011) = 2,652 (see Table 6.68)

a. Cromwell – International Visitors

This thesis uses the percentage break down of OCRT international visitors cited in Table 5.1 (Chapter 5, section 5.3.3.1) and the right hand column in Table 6.69 as a base to calculate from where in 2011 Cromwell international visitors originated. As presented in Table 6.69, of the 583 Cromwell international visitors, the majority or 249 visitors came from Europe, followed by 192 (32.9%) Australia, and 73 (12.6%) UK. Other Cromwell international visitors from North America, Middle East and Africa are in the range of 8 (1.4%) – 53 (9%) (Table 6.69).

Table 6.69: Cromwell international visitors 2011

Home place	NV ¹	%
Europe	249	42.7
Australia	192	32.9
UK	73	12.6
North America	53	9
Middle East	8	1.4
South Africa	8	1.4
Total	583	100

3. NV: Number of Visitors.

- Total visitor numbers (2011) = 2,652 (See Table 6.68)
- Percentage of international visitors (2011) = 22% (See Table 6.68)
- Total number of Cromwell international visitors = 583 (See Table 6.68)

b. Cromwell – Domestic Visitors

This chapter uses the percentage break down of OCRT domestic visitors in Table 5.3 (Chapter 5, section 5.3.3.2) and Table 6.70 (right hand column) to calculate the home places of Cromwell domestic visitors in 2011. Table 6.70 shows that of 2,069 Cromwell domestic visitors, the majority or 741 (35.8%) were from upper NI followed by 470 (22.75%) from central SI, 439 (21.2%) upper SI, 308 (14.9%) lower NI, and 111(5.35%) lower SI.

Table 6.70: Cromwell domestic visitors by home place

Region/ city	Number of visitors	%
Upper NI	741	35.8
Lower NI	308	14.9
Upper SI	439	21.2
Central SI (Otago)	470	22.75
Lower SI	111	5.35
Total	2,069	100

6.2.4. Transportation

This section explores the types of international and domestic transportation used by Cromwell’s visitors and calculates their EFs. The total EF of Cromwell visitor transportation is calculated through integration of the EFs of international and domestic travel.

6.2.4.1. International Transportation

a. Types of International Transportation

As discussed in the Section 6.1.4.1, in this study air travel is the only type of international transportation considered.

b. Cromwell – International Tourism-kilometres (T-km)

Table 6.71 shows that 583 Cromwell visitors (22%) are international tourists and the total distance between their home places and Auckland’s international airport is 7,198,999 T-km.

Table 6.71: Cromwell international Tourism-km

Home place	Assumed city of origin (central in country of origin)	Distance between central cities and Auckland (km).	Visitors		Total International T-km	Auckland to Dunedin (km, return)	Air domestic International visitors T-km from Auckland to Dunedin (return)
			No	%			
Australia	Sydney and Melbourne	2,512	192	32.9	482,304	2,156	413,952
Europe	Frankfurt	18,180	249	42.7	4,526,820	2,156	536,844
UK	London	18,334	73	12.6	1338309	2,156	157,388
North America	Montana Billings	11,950	53	9	633,350	2,156	114,268
Middle East	Tehran	15,005	8	1.4	120,040	2,156	17,248
South Africa	Pretoria	12,272	8	1.4	98,176	2,156	17,428
Total	-	78,253	583	100	7,198,999	-	1,257128

As discussed in Section 6.1.4.1-b, in this case study international travel distances are calculated as a one way trip. Because international tourists have to travel from Auckland to Dunedin and back, this part of the journey is a domestic flight and is equivalent to 1,257128 T-km, shown in Table 6.71 as Air domestic international visitors.

6.2.4.2. Types of Domestic Transportation

The types and percentages of transport use for holidays in New Zealand cited in Chapter 5 and shown in Table 5.5 (Matthews, 2009:13) are used as a pattern for transport used to access Cromwell.

a. Domestic Tourism-Kilometres (T-km)

This chapter uses Auckland as the central city for the upper NI and Wellington as the equivalent for the lower NI. In the same way, Nelson/Marlborough are used for the upper SI), Otago for the central SI, and Southland for the lower SI to calculate the distance between domestic visitors’ home places and Cromwell (Table 6.72). In addition, to measure the distance between home places of visitors from the upper SI, the average distance between Nelson and Cromwell and Marlborough and Cromwell is calculated and used (Table 6.72). Visitors to Cromwell who come by car/van from the upper NI (Auckland) and lower NI (Wellington), shown as the grey areas in Table 6.72, need to use the ferry to cross to the South Island. Distances between these places and Cromwell are separated into three parts; home to Wellington (except Wellington); Wellington to Picton by ferry; and Picton to Cromwell (Table 6.72).

Region	Central city	Distance to Cromwell (km-return)				Number of Visitors	Domestic T-km
		Auckland to Wellington	Wellington to Picton	Picton to Cromwell	Total		
Upper NI	Auckland					741	2,224,482
		1,318	204	1,480	3,002		
Lower NI	Wellington	-	204	1,480	1,684	308	518,672
Upper SI ¹	Nelson/Marlborough	1,6861			1,686	439	740,154
Central SI	Otago	1,252 ²			125	470	58,750
Lower SI	Invercargill, Southland	488			488	111	258,288
Total	-	-			-	2,069	3,800,346

1. Distance between upper SI and Cromwell is calculated as the average of distances between Nelson and Cromwell and Marlborough and Cromwell.
 2. Average distance between central Otago cities and OCRT (Cromwell).

According to Matthews (2009:13), in New Zealand 1% of people going on holiday are pedestrians but in this study these have been ignored as Cromwell is far from the places of origin of visitors. The remaining 3% of visitors are assumed to be domestic air travel. In addition, the ferry T-km of 228,021 (Table 6.73) are subtracted from the total car/van T-km of 3,610,329 to give the road T-km.

Table 6.73: Types of transport used by Cromwell domestic visitors (based on Matthews, 2009:13)

Type of Transport	Car/van driver/passenger	Bus	Car-Ferry	Air domestic
% of total	89	2	6	3
Tourist-km	3,382,308	76,007	228,021	114,010
Total domestic T-km	3,800,346			
• Numbers are rounded				

6.1.4.3. The Ecological Footprint (EF) of Cromwell Transportation

Table 6.74 shows that total transportation energy of Cromwell visitors (2011) is 26,946,557 MJ (26,946.6 GJ). The land to energy conversion capacity used in this thesis is the global average of 100 GJ/gha. As demonstrated in Table 6.74 the total EF of Cromwell transportation is $26,946.6 \text{ GJ} \div 100 \text{ GJ/gha} = 269.5 \text{ gha}$.

Table 6.74: EF of Cromwell transportation (2011)

Transport Mode	Tourist-km	Energy use MJ/passenger-km	Total annual energy use by OCRT visitors (MJ)
Air International	7,198,999	1.25 (Boeing 747)	8,998,749
Air domestic (International visitors from Auckland to Dunedin)	1,257,128	3.88	4,877,657
Air domestic	114,010	3.88	442,359
Car/van driver and passenger	3,382,308	3.1 (average)	10,485,155
Bus	76,007	1.01	76,767
Car-ferry	228,021	9.06	2,065,870
Total		Reference: Vale & Vale, 2009.	26,946,557
EF for all types of transportation used by Cromwell visitors			269.5
1. Total EF of Cromwell transportation includes: 138.8 gha (EF of international transportation) + 54.7 gha (EF of domestic transportation)			

Table 6.74 gives the total energy use of Cromwell transportation (26,946,557 MJ) made up of 13,876 GJ for air international and domestic travel by international visitors and 13,070 GJ for domestic visitor transportation. As a result, of total EF of Cromwell

transportation (269.5gha) is 51.5% (138.8 gha) for international travelers and 48.5% (130.7 gha) for domestic travelers.

6.2.5. Food

As shown in Table 6.67, 2,652 visitors went to Cromwell in 2011 and the mean number of nights they stayed was 3.6. Thus annual total visitor nights for tourists coming to Cromwell equal 9,547. Due to the lack of local information, the food consumption data presented by Collins et al (2005) are used to calculate the EF of food consumption for Cromwell visitors.

This chapter uses the same two scenarios to calculate the EF of food that were used for Naseby. In the first scenario, the EF of food is calculated based on the assumption 100% of food is conventional. In the second scenario, the total amount of food eaten by Cromwell visitors is separated into the two areas of local (home prepared) food (2.5% of total food) and conventional food (97.5% of total food). Comparison between the results of the two scenarios will indicate the influence exerted by the use of home prepared food (as a cultural product) on the EF and the Economic Footprint (ECF) of Cromwell.

6.2.5.1. The EF of Cromwell Food (First Scenario)

In the first scenario, the total amount of food eaten by Cromwell visitors has been assumed to have a footprint equivalent to that of food consumed outside the home by Cardiff residents. This totals 67.04 kg per resident/yr (Collins et al, 2005:25) with a footprint of 0.429gha/resident (Collins et al, 2005:32). This means 1kg of food eaten out has an EF of $0.429/67.04 \text{ gha/kg} = 0.006 \text{ gha/kg}$. The average amount of food eaten by a Cardiff resident each day is 1.85 kg, and this value has been used for visitors to Cromwell. The results are shown in Table 6.75. The EF of tourist food is equivalent to $1.85 \times 0.006 = 0.01 \text{ gha/visitor night}$ (Table 6.75). The total EF of food consumed by Cromwell's visitors is $9,547 \times 0.01 = 95.47 \text{ gha}$ and the EF of this food/visitor is $95.47 \text{ gha}/2,652 \text{ (total visitors)} = 0.036 \text{ gha}$ (Table 6.75).

Table 6.75: EF of food consumed by Cromwell visitors (2011)

Item	Data	Reference
Cromwell visitor numbers (2011)	2,652 (See Table 6.68)	
Average visitor nights/visitor	3.6	
Total visitor nights	9,547	
EF of food eaten out gha/cap	0.429	Collins et al , 2005:32
EF of tourist food gha/visitor night	0.01	
Total EF of food consumed by Cromwell visitors (gha)	95.47	
EF of food consumed by Cromwell visitors/visitor (gha/visitor)	0.036	

6.2.5.2. The EF of Cromwell Food (Second Scenario)

In Cromwell local products (such as food, beverage and wine) are offered to visitors by 492 separate accommodation services with 3,170 available bed spaces (Appendix 5- Rows188-200- Cromwell). The information related to Cromwell products arising from Appendix 5, are summarised and set out in Table 6.76.

Table 6.76 demonstrates that in 2011, of the 19 (3.8% of the total 492 accommodation services with 267 bed spaces) that offered local produce, 4 (0.8% of total with 78 bed spaces) offered home baking and local food and beverages to their visitors and 2 (2% of total with 189 bed spaces) offered locally produced wine. Since the total visitor nights for Cromwell are 9,547 and total Cromwell bed spaces are 3,170, the average visitor nights per bed space is $9,547 \div 3,170 = 3.01$ visitor nights/bed space. Consequently as shown in Table 6.76, the total visitor nights that Cromwell visitors consume local food is $78 \times 3.01 = 235$ visitor nights, equal to 2.5% of total 9,547 Cromwell visitor nights (Table 6.76).

Table 6.76. Cromwell local produce (summary)

Produce	F	%	% of 492 accommodations services	Bed spaces	Visitor nights ¹
Local food and beverage	4	21	0.8	78	235 ²
Wine	15	79	3	189	569
Total	19	100	3.8	267	

1. Average visitor nights/bed space = $9,547$ (total visitor nights)/ $3,170$ (total bed spaces) = 3.01
2. 78 (bed spaces) \times 3.01 (average visitor nights per bed space) = 235 visitor nights

This chapter uses the EFs of home cooked and conventional foods (per capita, per kg and per visitor night) as discussed in Chapter 5 (section.5.5.2 and Tables 5.11 and 5.12) to calculate the EFs of home cooked and conventional foods consumed by Cromwell's visitors, as in the following table.

Home prepared and local food	EF	Conventional food	EF
EF of local food gha/cap	0.254	EF of 1 kg conventional food eaten out (gha/cap)	0.429
EF of 1 kg local food gha/kg	0.0037	EF of tourist food (gha/visitor night)	0.01
EF of local food gha/visitor night	0.0068		
EF of local food of 235 visitor nights (gha)	1.59	Total EF of conventional food consumed by Cromwell visitors/9,312 ¹ visitor nights (gha)	93.12
Total EF of home cooked and conventional foods (gha)			94.71
1. 9,547 (total visitor nights) – 253 (visitor nights that tourists consume local food) = 9,312			

Table 6.77 indicates that the EF of local food consumed by Cromwell visitors in 2011 is $235 \text{ visitor nights} \times 0.0068 \text{ gha} = 1.59 \text{ gha}$. As the total visitor nights are 9,547 (see Table 6.67) and the number of visitor nights that visitors consume home cooked food is 235, consequently the total visitor nights that visitors to Cromwell consume conventional food is $9,547 - 235 = 9,312$ visitor nights (see Table 6.77). Likewise the EF of conventional food consumed by Cromwell's visitors in 2011 is $9,312 \text{ visitor nights} \times 0.01 \text{ (EF of conventional tourist food, gha/visitor night)} = 93.12 \text{ gha}$ (Table 6.77). The total EF of consumed food in the second scenario (present circumstance) including the EFs of conventional and home prepared food is $93.12 \text{ gha} + 1.59 \text{ gha} = 94.71 \text{ gha}$ (Table 6.77).

6.2.5.3. Environmental Effects of using local Food

Comparing the results of the two scenarios shows that producing 2.5% (435kg) of (17,662 kg) food locally reduces the total EF of food by 0.76 gha (0.8 % of 95.47 gha) (Table 6.78).

	100% (17,662 kg) conventional eaten out food ¹	97.5 % (17,227 kg) conventional eaten out food and 2.5 % (435 kg) home cooked (organic) food
Cromwell EF of food	95.47	94.71
Reduction in EF of food consumed by Cromwell visitors (gha)	0.76	
1. 9,547 (Total visitor nights) \times 1.85 kg (food/visitor night) = 17,662 kg		

6.2.6. Accommodation Services

6.2.6.1. Types of Accommodation Services

This thesis places the 492 Cromwell accommodation services into the four categories of self-contained (SC), bed and breakfast (B&B), motel, and powered and non-powered camping sites based on the information collected through using 12 official websites related to OCRT Cromwell accommodation services (Appendix 5 and 6-rows: 188-200). Table 6.79 summarises the parts of Appendix 5 that address available bed spaces by types of accommodation service. As shown in Table 6.79 and Figure 6.41, in 2011, of the total 492 Cromwell accommodation services, the majority or 95.7% are camping sites (including 58.5% powered and 37.2% non-powered sites) followed by 2.9% motels, 1% SC and 0.4% B&B. Looking at available bed spaces, the majority or 89.1% still occur in camping sites (including 54.5% powered and 34.6% non-powered sites), followed by 7.2% in motels, 3.2% in B&Bs and 0.5% SC.

Type	Q ¹	Number	%	Available bed spaces	%
SC	NB	5	1	15	0.5
B&B	NB	2	0.4	100	3.2
Motel	NB	14	2.9	229	7.2
Camping (powered sites)	NB	288	58.5	1,728	54.5
Camping (non-powered sites)	NB	183	37.2	1,098	34.6
Total		492	100	3,170	100

1. Quality of buildings and sites used as accommodation services at Cromwell

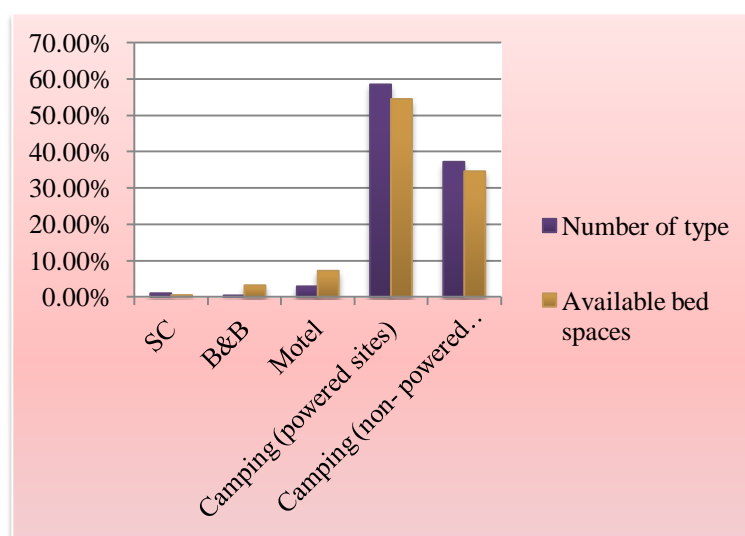


Figure 6.41: Percentage and available bed spaces by type of accommodation service (2011)

6.2.6.2. Cromwell – Quality of Accommodation Services

This thesis reveals that 100% of Cromwell accommodation services that are offered through the OCRT websites are new buildings (see Appendix 5 and Table 6.79).

6.2.6.3. Cromwell Accommodation Services – Materials

The main materials for constructing of type of accommodation service (except camping sites) are set out in Appendix5 and the summarised information is shown in Table 6.80, Figures 6.41 and 6.42. Only two types of materials are used in Cromwell, timber and mixed timber (Table 6.80). As shown in Table 6.80 and Figure 6.42, of the total 344 accommodation bed spaces the majority or 54.4% (187) are timber and 45.6% (157) are timber mixed with other materials.

Material(s)	Total bed spaces	%	Type of accommodation service					
			SC		B&B		Motel	
			No	C	No	C	No	C
Timber	187	54.4	4	11	1	4	13	172
Timber (mixed with other materials)	157	45.6	1	4	1	96	1	57
Total bed spaces	344	100	5	15	2	100	14	229

- No = Number of accommodation services.
- C= Capacity (number of bed spaces).

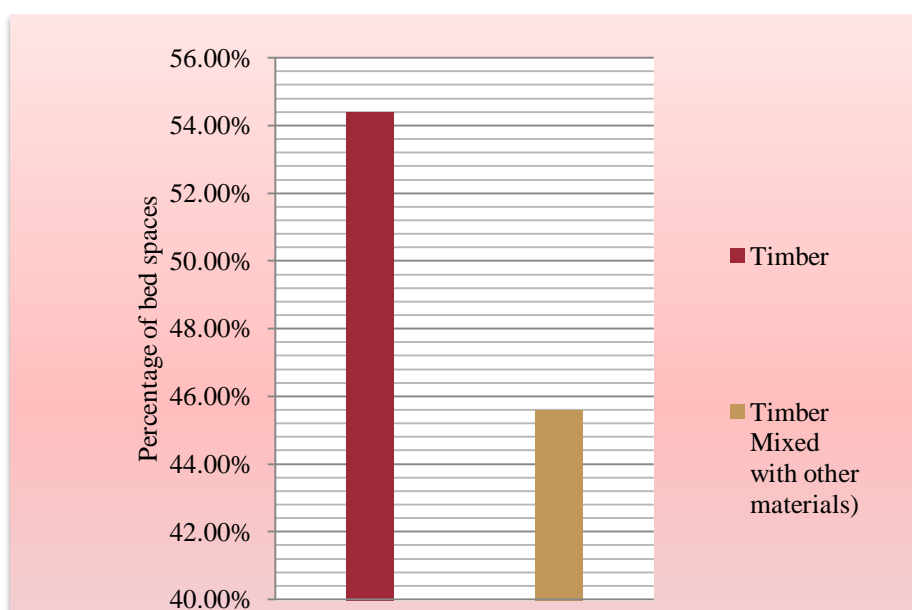


Figure 6.42: Cromwell – bed spaces by type of materials used (2011)

Table 6.80 and Figure 6.43 indicate that 15 SC bed spaces comprise 11 (73%) are timber as the main construction material and 4 (26.90%) are timber mixed with other materials. In the same way, out of the 100 B&B bed spaces available in Cromwell, 96 use timber as the main material and only 4 are timber mixed with other materials. Similarly, 172 (75.1%) out of 229 Cromwell’s motel bed spaces are timber and 57 (24.9%) are timber mixed with other materials.

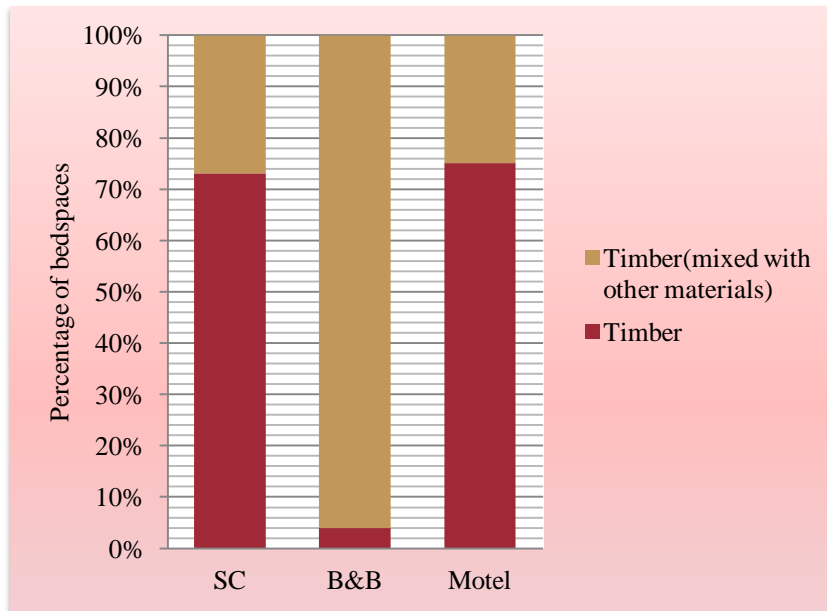


Figure 6.43: Cromwell - materials used by type of accommodation services (2011)

6.2.6.4. Accommodation Services – Energy Sources, Facilities and Spaces

As shown in Appendix 5 (rows 188-200) this research explores the energy sources and facilities used in the 492 Cromwell accommodation services through using related information and documents published in these accommodation services’ websites. This chapter classifies information related to the energy sources used, facilities and spaces, demonstrated in Appendix 5 and summarised in Appendices 29-33, by type of accommodation service. All heating systems found (EL, log, gas and solar) are investigated here. For facilities and equipment, TV and internet are chosen to be explored as using these facilities can be considered an indicator of a modern lifestyle (Appendices 29-33). Since using open air areas has been introduced earlier as one of the environmental and cultural indicators for evaluating architecture as being sustainable, verandas, balconies and outdoor seating areas are also investigated in this study. The following section presents data classified by type of accommodation service shown in Appendix33, and summarises Appendices 29- 32.

a. Cromwell SC Accommodation Services – Energy Sources, Facilities and Open Air Spaces (2011)

Figure 6.44, and Appendices 29 and 33 demonstrate that for the 15 SC bed spaces, 100% use electricity (for heating), have a TV and have access to the internet. Furthermore, 4 (26.6%) of Cromwell’s SC bed spaces have a private V/B and 11 (73.30%) have access to a shared outdoor sitting area (Figure 6.44 and Appendix 33).

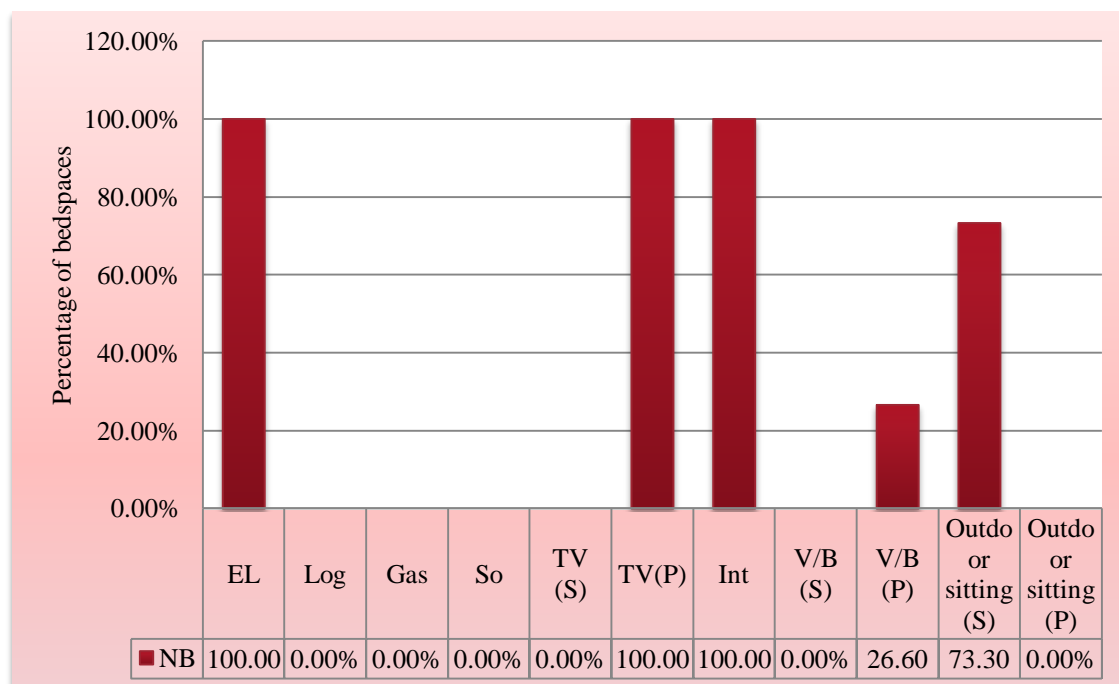


Figure 6.44: Cromwell SC accommodation services - energy sources, facilities and spaces (2011)

- El: Electricity
- So: Solar system
- TV (S): Share TV
- TV (P): Private TV
- Int: Internet
- V/B (S): Share veranda/ balcony
- V/B (P): Private veranda/balcony
- Outdoor sitting (S): Share outdoor sitting
- Outdoor sitting (P): Private outdoor sitting

b. Cromwell B&B Accommodation Services – Energy Sources, Facilities and Open Air Spaces (2011)

Figure 6.45, and Appendices 30 and 33 demonstrate that of Cromwell’s 100 B&B bed spaces, 96 use electricity and 4 use gas for heating. In addition, 100% of B&B bed spaces have both TV and access to internet, and 96 of them have access to 47 private outdoor sitting areas (Figure 6.45 and Appendix 33).

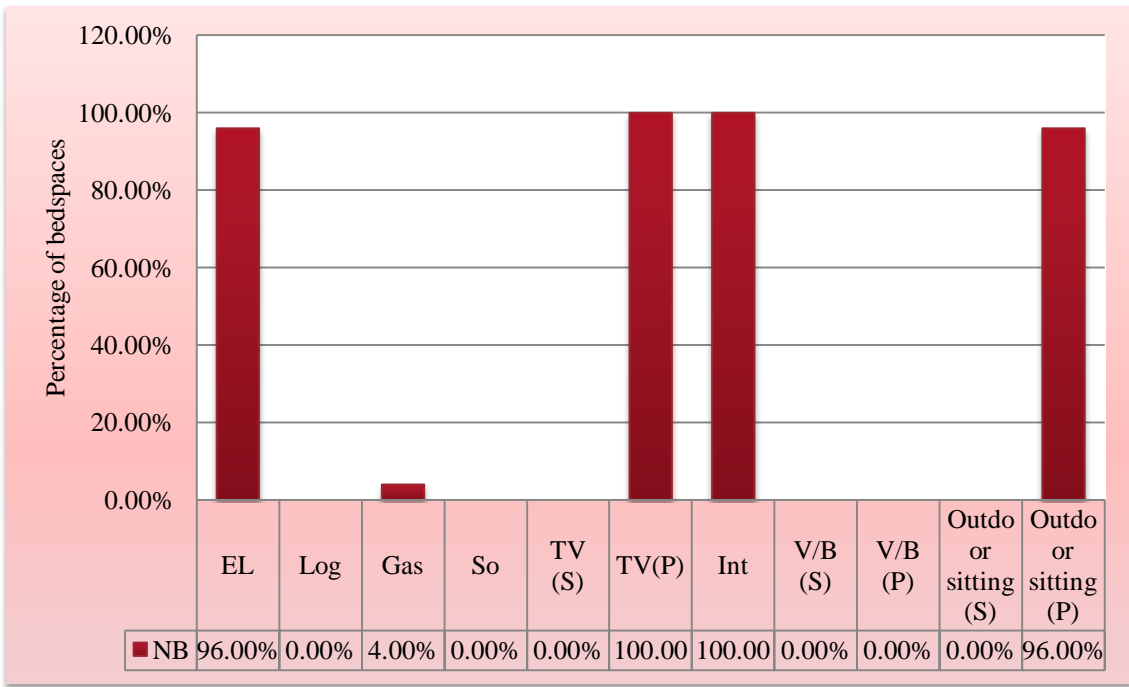


Figure 6.45: Cromwell B&B accommodation services - energy source, facilities and spaces (2011)

c. Cromwell’s Motel Accommodation Services – Energy Sources, Facilities and Open Air Spaces (2011)

As illustrated in Figure 6.46 and shown in Appendices.31 and 33, 213 (96%) of Cromwell’s 229 motel accommodation services use electricity as the main source for heating.

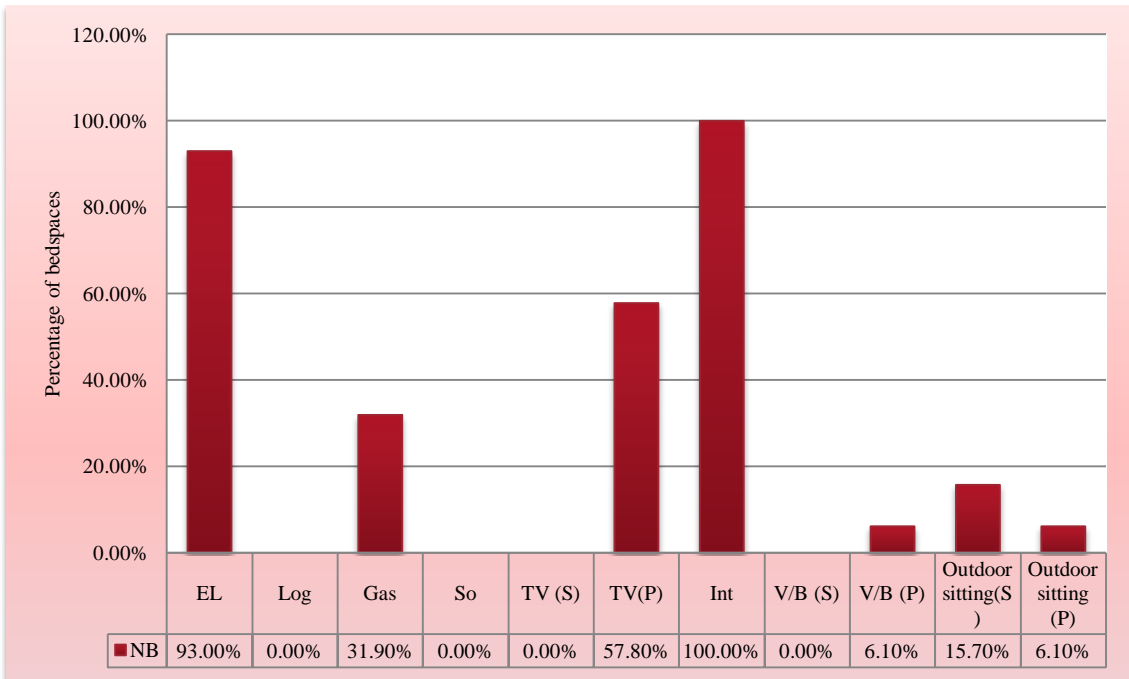


Figure 6.46: Cromwell’s Motel accommodation services - energy sources, facilities and spaces (2011)

Likewise, 73 (31.9%) of these bed spaces use gas (Figure 6.46 and Appendix 33). Furthermore, 130 (57.8 %) of the motel bed spaces have a private TV and 100% of them have access to the Internet. Also as demonstrated in Figure 6.46 and Appendix33, 14 motel bed spaces have private V/Bs and same number have access to private outdoor sitting areas. Furthermore, of the 229 motel bed spaces, 36 (15.70%) can use a shared outdoor sitting area (Figure 6.46 and Appendix 33).

d. Camping Accommodation Services – Energy Sources, Facilities and Open air Spaces (2011)

Figure 6.47 and Appendix 33 show that of Cromwell’s 2,826 camping sites (powered and non-powered), 1,728 (61.1%) of the powered sites use electricity (for heating cabins and caravans, lighting and other services such as the BBQ) and 100% of them have access to the Internet.

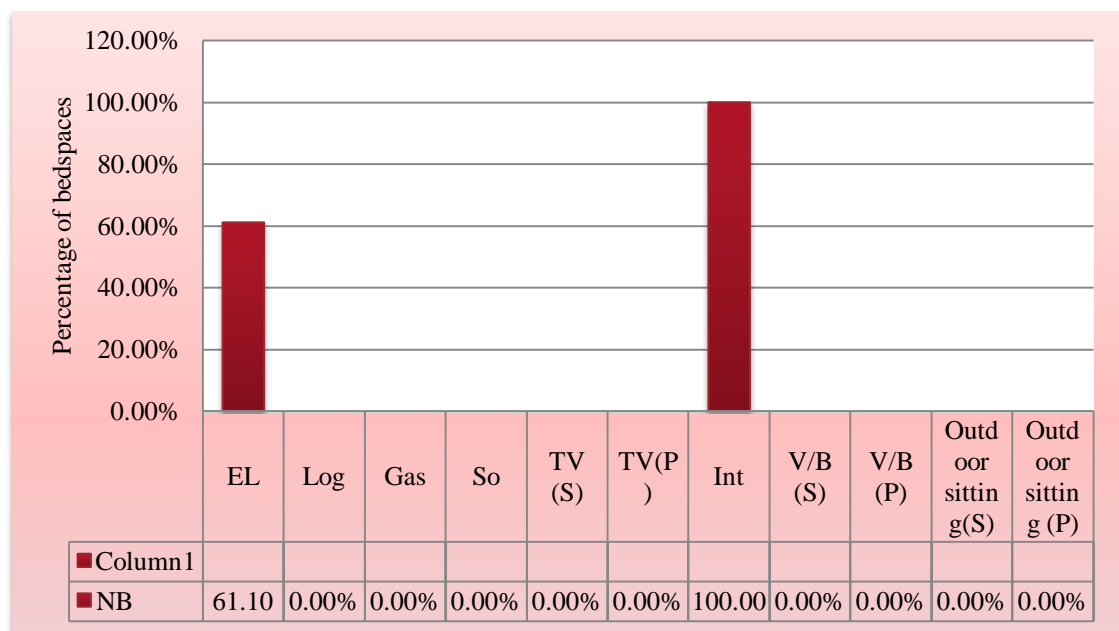


Figure 6.47: Cromwell’s camping sites - energy sources, facilities and spaces (2011)

e. All Types of Cromwell Accommodation Services – Energy sources, Facilities and Open air spaces (2011)

Figure 6.48, Appendix33 and Table 6.81 indicate the energy sources, facilities and open air spaces in all types of Cromwell accommodation services. As shown, of the 3170 bed spaces 62% (1,965) use electricity and 2.3% (73) use gas for heating. In addition, of the same total 3,170 bed spaces, 7.7% (245) have private TVs and 100% access to the Internet (Figure 6.48 and Table 6.81). Furthermore, 1.5% (47) of Cromwell’s bed

spaces have access to private open air spaces (including V/B and outdoor sitting areas) and 4% (128) can use shared open spaces.

Table 6.81: All Cromwell accommodation services by type - energy sources and facilities

Heating						So	%	TV				Int	%	Outdoor sitting ¹			
El	%	Lo g	%	Gas	%			S	%	P	%			S	%	P	%
1,965	62	0	0	73	2.3	0	0	0	0	245	7.7	3,170	100	47	1.5	128	4

1. In this table veranda/balcony and outdoor sitting are combined together.
 • Total Cromwell bed spaces = 3,170

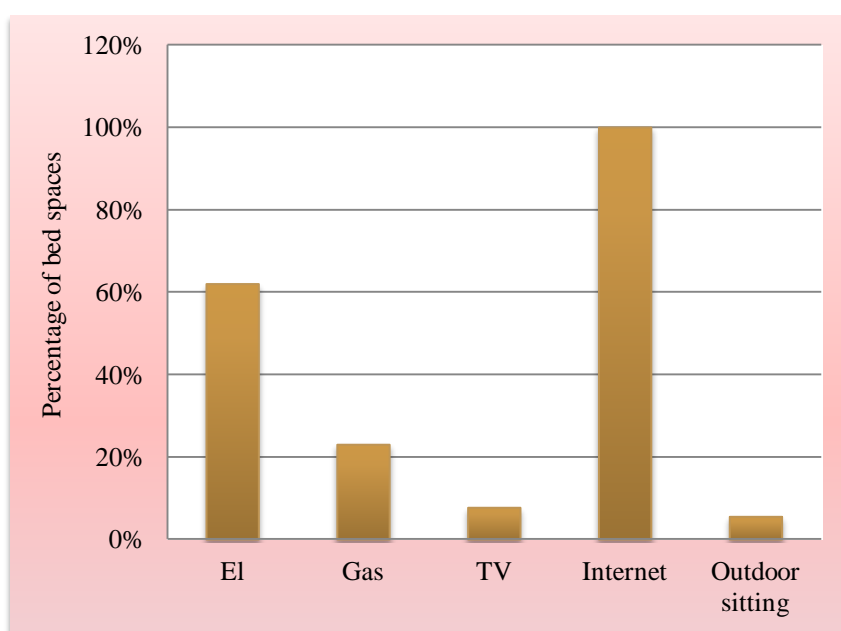


Figure 6.48: Cromwell accommodation services - energy sources, facilities and spaces (2011)

6.2.6.5. Cromwell Accommodation Services – Occupancy Share

This chapter calculates the occupancy shares of Cromwell’s accommodation services based on the occupancy shares of the OCRT accommodation services cited in Table 5.19 (Chapter 5-section 5.6.5). Since two types of accommodation service (Bp and homestead) are not found at Cromwell, 50% of the sum of their occupancy shares (cited in Table 5.19) has been included in the occupancy share of Cromwell SCs and another 50% has been included in B&B accommodation. Consequently, the occupancy of Cromwell SC accommodation is 13.1% (occupancy share of OCRT SC accommodation services in Table 5.19) + 8.5% (50% of total occupancy shares of OCRT Bp and homestead accommodation in Table 5.19) = 21.6% (see Table 6.82). In addition the occupancy share of Cromwell’s B&B accommodation is 13.9% (occupancy share of OCRT

B&B accommodation in Table 5.19) + 8.5% (50% of total occupancy of OCRT Bps and homesteads in Table 5.19) = 22.4% (See Table 6.82).

Since there are no hotel bed spaces in Cromwell, the hotel occupancy rate cited in Table 5.19 has been included in the occupancy share of motels. As a result, the occupancy rate of Cromwell motels is 21.1% (occupancy share of OCRT motels in Table 5.19) + 10.9% (occupancy share of OCRT hotels in Table 5.19) = 32% (occupancy share of Cromwell’s motels, see Table 6.82).

Table 6.82 comprises the visitor nights for each type of accommodation service found in Cromwell, which are calculated as: occupancy share of each type × total Cromwell-visitor nights (9,547, see Table 6.67). As shown in Table 6.82, Cromwell’s motels have the majority or 3,055 visitor nights, followed by camping sites (2,291), B&Bs (2,139) and SCs (2,062).

Type of accommodation service	% of visitor nights (2005)	Visitor nights (2011)
SC	21.6 ¹	2,062
B&B	22.4 ²	2,139
Motel	32 ³	3,055
Camping	24	2,291
Total	100	9,547 ⁴

1. SC % of visitor nights = 8.5% (50% of total Bp and homestead) + 13.1% (% of visitor nights of SC in 2005) (see Table 5.19).
 2. B&B % of visitor nights= 8.5% (50% of total Bp and homestead) + 13.9% (% of visitor nights of B&B in 2005) (see Table 5.19).
 3. Motel % of visitor nights = 10.9 % + 21.1% (see Table 5.19).
 4. See Table 6.67

6.2.6.6. Cromwell Accommodation Services – Area

This section uses the average area per bed of OCRT accommodation services (cited in Table 5.20) as the average area per bed of Cromwell’s accommodation services to calculate the total area of each type. Table 6.83 indicates that the total area of 492 Cromwell accommodation services is 25,178 m², including 443 m² SC, 4000 m² B&B, 3,779 m² motel, and 16,956 m² camping sites.

As shown in Table 6.83, the occupied area of each type of accommodation service is calculated as its total area multiplied by its percentage occupancy rate. Table 6.83 demonstrates that the total occupied area of Cromwell accommodation is 6,270 m², including 96 m² SC, 896 m² B&B, 1,209 m² motel and 4,069 m² camping sites.

Table 6.83: Cromwell Accommodation services - Total area and Occupied area (2011)

Type	No.	C	Area per bed (m ²) ¹	Total Area	Occupancy (%) ²	Visitor nights ²	Occupied Area (m ²)
SC	5	15	29.5	443	21.6	2,062	96
B&B	2	100	40	4,000	22.4	2,139	896
Motel	14	229	16.9	3,779	32	3,055	1,209
Camping	471	2,826	6	16,956	24	2,291	4,069
Total	492	3,170	-	25,178	100	9,547	6,270

1. See Table 5.20
2. See Table 6.82

6.1.6.7. The EF of Cromwell’s Accommodation Services

In the section of Cromwell accommodation services, two scenarios are used. In the first scenario, all areas of buildings are assumed to be indoor spaces. In the second scenario that reflects the current position of Cromwell’s accommodation services, the buildings include both indoor and open air (veranda and balcony) areas.

Comparison between the EFs of the two scenarios can indicate the influence exerted on the EF of Cromwell’s accommodation services by using open air spaces as part of the buildings used by tourists.

a. First Scenario: All Buildings are assumed to be Indoor Spaces

a.1 . The EF of Cromwell SC Accommodation Services

In Table 6.84, the total area of SC timber construction is calculated through the following equation:

$$\text{Total area of SC timber construction} = \text{the number of SC timber bed spaces (11, see Table 6.80)} \times \text{SC area/bed space (29.5 m}^2\text{, see Table 6.83)} = 325 \text{ m}^2$$

As the embodied energy of timber construction over a 50 year life cycle is 1.1 GJ/ m², the embodied energy of 325 m² of SC accommodation per a year is (325 m²× 1.1GJ) ÷ 50 = 7.15 GJ/year (Table 6.84).

The operational energy of SC accommodation as indicated in Table 6.84 is 0.3 GJ/m²/year. Since the occupied area of SC timber construction in Table 6.84 is 70 m², the total operating energy use of SC timber structures is 70 m² × 0.3 GJ/m²/year = 28 GJ/year (see Table 6.84). As shown in Table 6.84, the total life cycle energy use of SC timber structures is 7.15 GJ/year (total embodied energy) + 21 GJ/year (total operating

energy) = 28.15 GJ/year. Also the total EF of SC timber construction is equivalent to 28.15 GJ/year (life cycle energy used) ÷ 100 (average global carrying capacity) = 0.3 gha/year (Table 6.84).

This chapter uses the same method as above to calculate the EF of Cromwell’s SC accommodation services made of timber mixed with other materials (Table 6.84). As demonstrated in Table 6.84, this type of accommodation accounts for 123GJ/year life cycle energy and the EF is 0.1 gha/year. Consequently the total EF of Cromwell’s SC accommodation services is (0.3 + 0.1 gha) = 0.4gha (Table 6.84).

Table 6.84: Cromwell - life cycle energy of SC accommodation services (2011)

Material	Embodied energy over a 50-year life (GJ/m ²) ¹	Total Area (m ²) ²	Embodied energy (GJ/year)	Operational energy (GJ/m ² /year) ³	Occupied area (m ²) ⁴	Operating energy (GJ/year)	Life-cycle energy (GJ/year)	EF gha/year
Timber	1.1	325	7.15	0.3	70	21	28.15	0.3
Timber (mixed with other materials)	2.04	118	4.8	0.3	25	7.5	12.3	0.1
Total	-	-	11.95	-	95	28.5	40.35	0.4

1. See Table 5.27
 2. SC area/bed space = 29.5m² (See Table 5.20)
 3. See Chapter 5, section 5.6.8.1-c-(c-1) and Table 5.28
 4. Occupancy share of OCRT SC = 21.6% (See Table 6.82)

a.2 . The EF of Cromwell B&B Accommodation Services

Table 6.85 demonstrates that 160 m² of Cromwell B&B accommodation services of timber constructions have an embodied energy of 3.52 GJ/year and 3,840 m² B&Bs of mixed timber construction have an embodied energy of 156.6 GJ/year.

In Table 6.85, B&B operating energy is assumed to be 0.3 GJ/m²/year, equal to the B&B operating energy in Table 5.28. As determined in Table 6.85, Cromwell B&B accommodation services of timber construction use 10.8 GJ/year operating energy and those of mixed timber construction use 258 GJ/year. In addition the table shows that in Cromwell, timber B&B accommodation has a life cycle energy of 14.3 GJ/year and that of mixed timber construction has a life cycle energy of 414 GJ/year

The total EF of Cromwell B&B accommodation services as shown in Table 6.85 is 4.29 gha, made up of 0.14gha of B&B of timber construction and 4.15 gha of mixed timber construction B&Bs.

Table 6.85:Cromwell - life cycle energy of B&B accommodation services (2011)

Material	Embodied energy over a 50-year life cycle (GJ/m ²) ¹	Total Area (m ²) ²	Embodied energy (GJ/year)	Operation energy (GJ/m ² /year) ³	Occupied area (m ²) ⁴	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	160	3.52	0.3	36	10.8	14.3	0.14
Timber (mixed with other materials).	2.04	3,840	156.6	0.3	860	258	414.6	4.15
Total		4,000	160.12		896	268.8	428.9	4.29

1. See Table 5.27
 2. B&B area/bed space = 40 m² (see Table 5.20)
 3. See Chapter 5-section 5.6.8.1-c-(c-1) and Table 5.28
 4. Occupancy rate of OCRT B&B = 22.4% (see Table 6.82)

a.3. The EF of Cromwell Motel Accommodation Services

Cromwell’s motel accommodation services comprise 2,907 m² timber and 963 m² mixed timber constructions that use 64 and 39.3 GJ/year respectively of embodied energy (Table 6.86).

The motel operating energy use is shown in Table 6.86 and is assumed to be the same OCRT motel operational energy use, cited in Table 5.28 (0.57 GJ/m²/year). In Cromwell, motels of timber construction use 153.2 GJ/year and those with mixed timber construction 50.8 GJ/year for their operating energies (Table 6.86). Moreover, total lifecycle energy use of Cromwell motels is 307.1 GJ/year, the sum of the life cycle energy use of timber (217 GJ/ year) and mixed timber (90.1 GJ/year) constructions (Table 6.86).

As shown in Table 6.86, the total EF of the motel accommodation services of Cromwell is 3.07 gha, made up of the EFs of motels of timber (2.17gha) and mixed timber (0.9 gha) constructions.

Table 6.86. Cromwell - life cycle energy use of motel accommodation services (2011)

Material	Embodied energy over a 50-year life cycle (GJ/m ²) ¹	Total Area (m ²) ²	Embodied energy (GJ/year)	Operational energy (GJ/m ² /year) ³	Occupied area (m ²) ⁴	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Timber	1.1	2,907	64	0.25	613	153.2	217	2.17
Timber and masonry	2.04	963	39.3	0.25	203	50.8	90.1	0.9
Total	-	3,870	102	-	816	204	307.1	3.07

1. See Table 5.27
 2. Motel area/bed space = 40m² (see Table 5.20)
 3. See Chapter 5-section 5.6.8.1-c-(c-1) and Table 5.28
 4. Occupancy rate of OCRT Motels = 32% (see Table 6.82)

a.4. The EF of Cromwell Camping Accommodation Services

The total available bed spaces of camping sites at Cromwell are 2,826 bed spaces including 1,728 (61.1%) in powered sites and 1,098 in non-powered sites (Table 6.87). This section uses these proportions to divide the total 2,291 camping visitor nights into 1,400 (61.1%) that use powered sites in Cromwell and 891 (38.9%) that stay at non-powered sites (Table 87).

Table 6.87: Cromwell camping sites – available bed spaces and visitor nights

Type	No.	Available bed spaces ¹	%	Visitor nights
Powered sites	288	1,728	61.1	1,400
Non- powered sites	183	1,098	38.9	891
Total	471	2,826	100	2,291 ²

1. See Table 6.80
 2. See Table 6.83

As explained in Table 6.88 the embodied energy of Cromwell camping sites is not available and this study considers the operational energy use of this type of accommodation to be the same as its life cycle energy use. Table 6.88 indicates that the total EF of 288 Cromwell powered sites (see Table 6.87) with 1400 visitor nights and 0.025 GJ/visitor night operational energy use is 0.35 gha/year.

Table 6.88: Cromwell - life cycle energy use of camping (powered sites) accommodation services (2011)

Material	Embodied energy over a 50 year life cycle (GJ/m ²)	Total visitor nights	Embodied energy (GJ/year)	Operation energy (GJ/visitor night) ²	Operating energy (GJ/year)	Life-cycle energy use (GJ/year)	EF gha/year
Assumed negligible	N/A	1400 ¹	N/A	0.025	35	35	0.35

1. See Table 6.87
 2. See Table 5.28

a.5. Total EF of Cromwell Accommodation Services (First Scenario)

The total EF of Cromwell accommodation services in the first scenario in which all associated areas are assumed to be indoor spaces is 8.11gha /year (Table 6.89). As demonstrated in this table, Cromwell B&B accommodation accounts for the largest share of the EF at 4.29 gha, followed by motel (3.07gha), SC (0.4gha) and camping sites (0.35gha).

Type of accommodation	EF (gha/year)
SC	0.4
B&B	4.29
Motel	3.07
Camping	0.35
Total	8.11

b. The EF of Cromwell Accommodation Services (Second Scenario)

This section attempts to determine the influence of using open air spaces including verandas and balconies (V/B) on the EF of Cromwell's accommodation buildings. In this scenario, the accommodation services contain both indoor and outdoor spaces and their EFs comprise the EFs of both types of space. The difference between the results of the first and second scenario indicates the influence of using open air areas on the EF of Cromwell accommodation services.

Table 6.90 contains summarised information about the numbers and types of V/Bs and outdoor sitting areas by type of accommodation, which are explained in Appendix 5 (rows-188-200). Table 6.90 shows that 4 Cromwell SC bed spaces have access to 2 private V/Bs. Furthermore, as shown in Table 6.90, 14 Cromwell's motel bed spaces have access to 2 shared outdoor sitting areas. Since the outdoor sitting areas are considered to be part of the landscaping, in this thesis their EF is not included

Type	V ¹ /B ²				Outdoor sitting			
	S ³	NV ⁴	P ⁵	NV	S	No ⁶	P	No
SC	0	0	4	2	11	2	0	0
B&B	0	0	0	0	0	0	96	46
Motel	0	0	14	2	36	1	14	2

1. V: Veranda
 2. B: Balcony
 3. S: Number of bedrooms sharing outdoor area
 4. NV: Number of verandas/ balconies
 5. P: Number of bedrooms using private area
 6. No: Number of outdoor sitting spaces

Table 6.91 indicates that the embodied energy intensity of 57.2 m² of Cromwell V/B is 0.7 GJ/year. Since V/Bs are open areas and do not use operational energy, in particular for heating, their operational energy is assumed to be zero. As a result, the life cycle energy use of 57.2 m² V/B is equal to its embodied energy (0.7 GJ/ year) and its EF is 0.7 (life cycle energy use) ÷ 100 (global average carrying capacity of land) = 0.007 gha (Table 6.91).

Type	Embodied energy (GJ/m ² per year)	Area (m ²) ¹⁻	Embodied energy (GJ/year) ³	Operating energy	Life-cycle energy (GJ/year)	EF (gha)
Veranda/balcony	0.012	57.2	0.7	0	0.7	0.007

1. Total numbers of verandas/balconies = 4 (see Table 6.91)
 2. Average area (m²) of veranda/balcony = 14.3 (Table 5.40)
 3. Embodied energy of veranda/ balcony (GJ/m²/year) = 0.012 (Table 5.42)

In Table 6.29, the total 25,178 m² of Cromwell accommodation services (see Table 6.92) is separated into the two areas of 25,120.8 m² indoor spaces and 57.2 m² V/B. The EF of indoor spaces is 0.00032 gha /m² (8.11gha ÷ 25,178m²). Thus the EF of 25,120 m² indoor spaces is 25,121m² × 0.00032 gha/m² = 8.039 gha (Table 6.92). Likewise the EF (gha) of 57.2 m² V/B is equivalent to 0.007 gha (see Table 6.91). As a result the total EF of 25,178 m² accommodation services in Cromwell composed of 25,120.8 m² indoor spaces and 57.2 m² V/B is the sum of 8.039 and 0.007gha = 8.046 gha (Table 6.92).

As shown in Table 6.89, in the first scenario in which all Cromwell accommodation services are assumed to be indoor spaces, the total EF (EF1) is 8.11 gha. In the second scenario where both indoor and outdoor spaces are considered, the total EF (EF2) is 8.046 gha. Thus the 0.064 gha difference between the two EFs (EF1 and EF2) can be considered the reduction in Cromwell accommodation EF influenced by the use of 57.2 m² veranda and balcony (Table 6.92). On the other hand, as 0.064 gha (640 m²) ÷ 57.2 m² = 11.2 m², it can be considered that using 1m² of V/B reduces the EF of Cromwell accommodation by 11.2 m².

Table 6.92: Reduced EF of Cromwell accommodation services influenced by the use of veranda/balcony

Indoor spaces and camping sites			Outdoor sitting (Veranda/balcony)		
Area (m ²)	EF (gha/m ²)	EF (gha)	Area (m ²)	EF (gha/m ²)	EF (gha)
25,120.8	0.00032	8.039	57.2	0.00012	0.007

- Total area of the Cromwell accommodation services (m²) = 25,178 (see Table 6.83).
- Total EF of Cromwell accommodation services (first scenario) gha= 8.11 (see Table 6.89)
- Total EF of Cromwell accommodation services (indoor space + veranda/balcony) gha = 8.046
- Reduction in EF of Cromwell accommodation by use of 57.2 m² veranda/balcony (0.2% of 25,178 m²) = 8.11 – 8.039 = 0.064gha = 640 m²
- Reduction in Cromwell EF by use of 1m² veranda/balcony = 11.2m²

6.2.7. Tourism Products and Activities (Frequency)

This section investigates the environmental impacts of Cromwell visitor activities (as a part of their social-cultural behaviours) through calculation of their EF. The first step is to make assumptions about the frequency of activities offered by Cromwell accommodation services to visitors through using the official websites of the OCRT and 12 websites related to Cromwell accommodation services. The activities offered are explained in Appendix 5 (rows 188-200) and are classified into the two categories of indoor and outdoor activities in Appendix 34.

In addition the frequency of the offered activities as shown in Appendix 34 and summarised in Tables 6.94 and 6.95 can be considered as an indicator of the attitude of Cromwell OCRT participants (in this case accommodation owners) to types of tourism activity, and consequently to sustainability. Comparison between the EFs of the activities and their frequency also can indicate from a social-ecological perspective the attitude of tourists to being sustainable.

6.2.7.1. Local Produce

The frequency of local products offered by the Cromwell's accommodation services and the environmental effects of using home prepared foods have been discussed above in section 6.2.5.2 and demonstrated in Table 6.76.

6.2.7.2. Tourism Activities

The activities offered by Cromwell accommodation services are explained in Appendix 5 (rows 188-200) and classified into indoor and outdoor activities in Appendix 34. The

following section of this chapter investigates the frequency of these offered activities and their environmental impacts through calculation of their ecological footprints.

a. Indoor Visitor Activities (Frequency)

Table 6.93 presents the frequencies of reading materials as only indoor activity offered by Cromwell accommodation services to their visitors (Appendices 5 and 34). The table shows that only 2 of 12 websites related to 492 Cromwell accommodation services offer an indoor activity to their visitors.

Activity	F	%
Reading materials	2	100

b. Cromwell – Outdoor Visitor Activities (Frequency)

This study found 20 types of outdoor activity offered by Cromwell accommodation services to visitors in 2011, as shown in Appendices 5, 34 and 35. These are classified into the 8 types of activities shown in Table 6.94.

Outdoor activity	F	% ¹
Water sports	48	38
Walking	6	4.8
Winter sports	15	11.9
Cycling	15	11.9
Motorised sports and activities	6	4.8
Recreational activity	15	11.9
Sports (at playground)	20	15.9
Sports on horseback	1	0.8
Total	126	100

Figure 6.49 and Table 6.94 illustrate that the largest occurrence of an offered activity is water sports at 48 (38%), followed by sports at a play ground 20 (15.9%), winter sports, cycling and recreational activities all at 15 (11.9%). Likewise other outdoor activities including motorised sports and walking have equal frequencies of occurrence of 6 (4.8) (Figure 6.49 and Table 6.94).

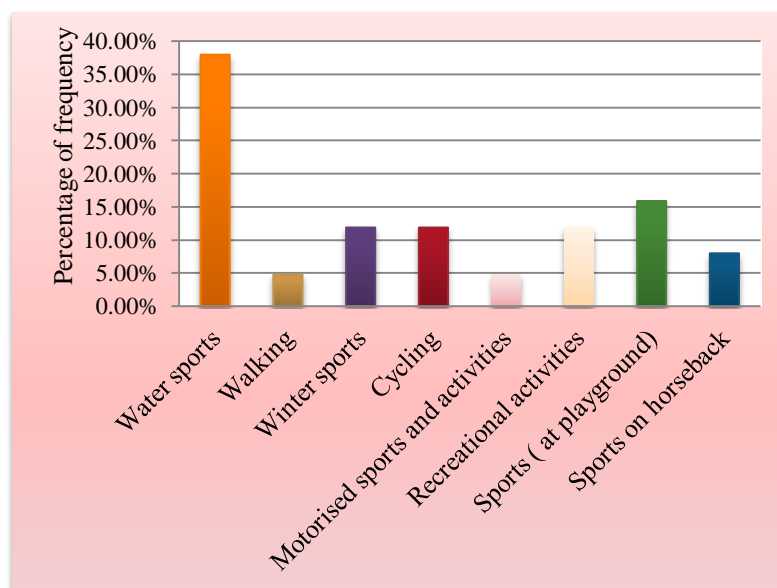


Figure 6.49: The frequency of outdoor activities offered by Cromwell accommodation services to its visitors

c. Cromwell –Frequency of the Subjects Offered to Visit

As shown in Appendix 5 this chapter looks at subjects to visit offered by Cromwell accommodation services to visitors in 2011. Appendix 35 contains summarised information about Cromwell visiting activities and their frequency. Table 6.95 and Figure 6.50 classify the 10 categories of subjects offered to visit cited in Appendices 5 and 35 into five types: cities and villages, historical sites and buildings, scenery, museum/art gallery, and gardens.

Subjects	F	%
Cities and villages	17	32.7
Historic sites and buildings	5	9.6
Scenery	4	7.7
Museum/art gallery	1	2
Gardens	25	48
Total	52	100

As illustrated in Figure 6.50 and Table 6.95, gardens are offered the most at 25 (48%) mentions, followed by cities and villages 17 (32.7%), historic sites and buildings 5 (9.5%), scenery 4 (7.7%), and museum/art gallery 1 (2%).

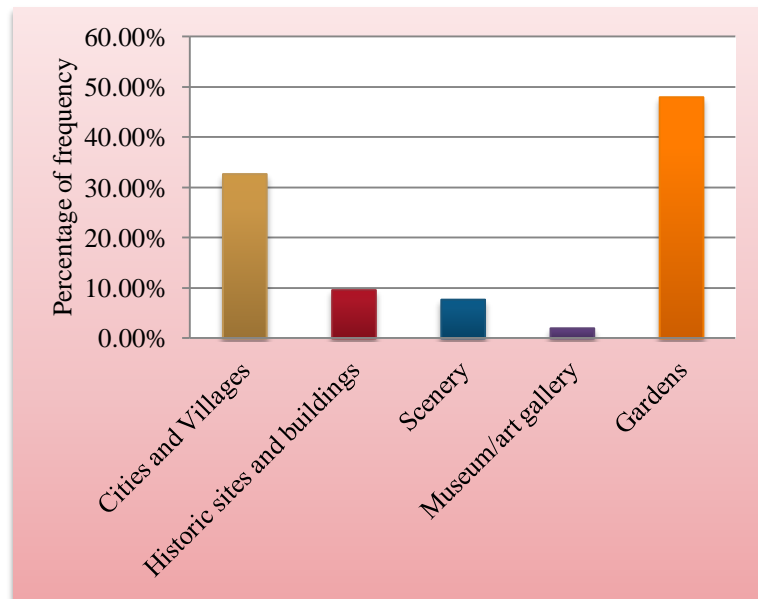


Figure 6.50: The frequency of subjects offered by Cromwell accommodation services to visit (2011)

d. Activities per Visitor

This section calculates the number of Cromwell visitors per activity (except visiting old Cromwell town) through using the percentage split of 160 visitors (Table 5.48) and applying this to the 2,652 Cromwell visitors in 2011 (Table 6.96).

Activity	% of 2,652 visitors ²	Number of Visitors
Curling (at Naseby)	36.9	979
Taieri Gorge Railway	46.3	1,228
Gold mining towns	35	928
Sightseeing tours	30.6	812
Old Cromwell town	100	2,652
Wineries	16.9	448
Visiting friends and relatives	15	398
Hayes engineering	8.1	215
Mountain biking at Naseby	2.5	66
Fishing	1.9	50
Golf	1.3	34
Swim at Ophir and Alexandra	0.6	16
Clyde Dam Tour	0.6	16
Golden Progress mine	0.6	16
Walking	0.6	16
Ophir high country farm	0.6	16
Biking	0.6	16
Fruit picking along trail	0.6	16
Total	-	7,922

1. See Table 6.67
 2. % of 2,652 visitor assumed same as % of 160 visitors cited in Table 5.45 except for visitors to old Cromwell town.
 • Reference: CODC, 2011:18

The assumption is that the visitors who come to Cromwell will go to the old town but will also do other activities. The number of OCRT visitors who visit Cromwell is already known (see Table 4.45). Table 6.96 shows that in comparison with other Cromwell activities, the majority of visitor activities is visiting old Cromwell town (2,652), followed by Taieri Gorge Railway (1,228), curling at Naseby (979), visiting gold mining towns (928), and sightseeing tours (812). The numbers of Cromwell visitors who do other types of activity fall between 16 and 448.

6.2.8. EF of Visitor Activities

6.2.8.1. EF of Indoor Activities (Curling at Naseby)

As indicated in Table 6.97, 979, 7.5% of the total 13,000 visitors who went curling at Naseby stay at Cromwell. Since the total EF of 13,000 visitors is 2.07gha, the EF of Cromwell visitors equals 7.5% of 2.07 = 0.16 gha (Table 6.97).

Table 6.97: Cromwell visitors - curling EF (gha) (2011)

Total number of Cromwell visitors	% of Cromwell visitors who play indoor curling at Naseby ¹	Total number of Cromwell visitors who play curling at Naseby ¹	EF of 13,000 visitors of curling centre (gha)	EF of 979 Cromwell visitors (7.5 % of 13,000 indoor curling centre visitors) gha ²
2,652	36.9	979	2.07 ³	0.16

1. See Table 6.34

2. EF of Cromwell curling (indoor curling) per visitor per 3 hours playing/ year = (0.15 gha ÷ 979 visitors) 0.00016 (gha)

3. See Table 5.56

6.2.8.2. EF of Outdoor Activities

a. EF of Walking

Tables 6.96 and 6.98 show that 16 Cromwell visitors chose walking as a tourist activity. As shown in Chapter 5 (Table 5.58) the EF of a visitor who walks 3 hours is 0.00005 gha. Thus the EF of 16 Cromwell visitors who walk 3 hours is equivalent to: 0.00005 (gha/visitor) ×16 (number of visitors) = 0.0008 (gha) (Table 6.98).

Table 6.98: Ecological footprint of Cromwell visitors (walking).

Number of Cromwell visitors who walk.	16 ¹
EF (gha) of Cromwell visitor who walks 3 hours	0.00005 ²
EF of 16 Cromwell visitors who walk 3 hours (gha)	0.0008

1. See Table 6.96

2. See Table 5.58

b. The EF of Golf

Tables 6.96 and 6.99 show 34 Cromwell visitors played golf 2011. Table 6.96 and 6.99 indicate that the EF of a visitor who plays golf is 0.003 gha/ visitor. Consequently the EF of the 34 Cromwell visitors playing golf is $34 \times 0.003 \text{ gha/visitor} = 0.102 \text{ gha}$ (Table 6.99).

Number of Cromwell visitors who play golf	34 ¹
EF (gha) of Cromwell visitor who plays golf	0.003 ²
EF of 34 Cromwell visitors who play golf (gha)	0.1
1. See Table 6.96	
2. See Table 6.96	

c. EF of Mountain Biking

As shown in Tables 6.96 and 6.100, 66 Cromwell visitors went mountain biking in 2011. Tables 6.96 and 6.100 indicate that the EF of a visitor who goes mountain biking is 0.0009 gha/visitor. As a result the EF of 66 mountain biking Cromwell visitors is $66 \times 0.0009 \text{ gha/visitor} = 0.06 \text{ gha}$ (Table 6.100).

Number of Cromwell visitors who go mountain biking	66 ¹
EF (gha) of Cromwell visitors who goes mountain biking	0.0009 ²
EF of 66 Cromwell visitors who go mountain biking (gha)	0.06
1. See Table 6.96	
2. See Table 6.96	

d. EF of Fishing

In 2011, 50 Cromwell visitors chose fishing as a leisure activity (Tables 6.96 and 6.101). Since the EF of a visitor fishing is 0.0009 gha (see Tables 6.96 and 6.101), the EF of 50 Cromwell visitors fishing is $0.0009 \text{ (gha/visitor)} \times 50 \text{ (visitors)} = 0.045 \text{ gha}$ (Table 6.101).

Number of Cromwell visitors who fish	50 ¹
EF (gha) of Cromwell visitors who fish	0.0009 ²
EF of 50 Cromwell visitors fishing (gha)	0.045
1. See Table 6.96	
2. See Table 6.96	

e. EF of Swimming at Ophir and Alexandra

Tables 6.96 and 6.102 show 16 Cromwell visitors went swimming at Ophir and Alexandra in 2011. Tables 5.69 and 6.102 determine that the EF of a visitor who swims is 0.0009 gha. As a result the EF of 16 Cromwell visitors going swimming is 16×0.0009 gha/visitor = 0.014 gha (Table 6.102).

Table 6.102: Ecological footprint of Cromwell visitors (swimming)	
Number of Cromwell visitors who swim	16 ¹
EF (gha) of Cromwell visitors swimming	0.0009 ²
EF of 16 Cromwell visitors swimming (gha)	0.014
1. See Table 6.96	
2. See Table 5.69	

f. EF of Wineries

Tables 6.96 and 6.103 show that 448 people who came to Cromwell visited wineries. Table s.5.70 and 6.103 determine that the EF of a visitor going to a winery is 0.00006 gha/ visitor. As a result the EF of 448 Cromwell visitors who go to wineries is 448×0.00006 gha/visitor = 0.027 gha (Table 6.103).

Table 6.103: Ecological footprint of Cromwell visitors (wineries)	
Number of Cromwell visitors who visit wineries	448 ¹
EF (gha) of Cromwell visitor to winery	0.00006 ²
EF of 448 Cromwell visitors to wineries (gha)	0.027
1. See Table 6.96	
2. See Table 5.70	

g. EF of Sightseeing

Tables 6.96 and 6.104 indicate that 812 visitors chose sightseeing as one of their activities at Cromwell. As explained in Table 5.71 (Chapter 5) the EF of a visitor sightseeing is 0.0009 gha. Consequently, the EF of 812 Cromwell visitors is 812×0.0009 gha/visitor = 0.73 gha (Table 6.104).

Table 6.104: Ecological footprint of Cromwell visitors (sightseeing)	
Number of Cromwell visitors sightseeing	812 ¹
EF (gha) of Cromwell visitor sightseeing	0.0009 ²
EF of 812 Cromwell visitors sightseeing (gha)	0.73
1. See Table 6.96	
2. See Table 5.71	

h. EF of Hayes Engineering

Hayes Engineering heritage was visited by 215 Cromwell visitors as shown in Tables 6.96 and 6.105. Since the EF of a visitor in this case is 0.00006 gha (see Table 5.72) the

EF of the latter visitors is equivalent to 215 (number of visitors) \times 0.00006 gha/visitor = 0.013 gha (Table 6.105).

Table 6.105: Ecological footprint of Cromwell visitors (Hayes Engineering)	
Number of Cromwell visitors to Hayes Engineering	215 ¹
EF (gha) of a Cromwell visitor to Hayes Engineering	0.00006 ²
EF of 215 Cromwell visitors to Hayes Engineering (gha)	0.013
1. See Table 6.96	
2. See Table 5.72	

i. EF of Ophir High Country Farm

The total EF of 16 Cromwell visitors who go to Ophir High Country Farm Tour is calculated as for the examples above. As shown in Table 6.106 it is 0.001gha.

Table 6.106: Ecological footprint of Cromwell visitors (Ophir High Country Farm)	
Number of Cromwell visitors to Ophir High Country Farm	16 ¹
EF (gha) of Cromwell visitor to Ophir High Country Farm	0.00006 ²
EF of 16 Cromwell visitors to Ophir High Country Farm (gha)	0.001
1. See Table 6.96	
2. See Table 5.73	

j. EF of Visitors to Taieri Gorge Railway

Using the same method as before the total EF of 1,228 Cromwell visitors to the Taieri Gorge Railway is 0.074 gha (Table 6.107).

Table 6.107: Ecological footprint of Cromwell visitors (Taieri)	
Number of Cromwell visitors to Taieri GR	1,228 ¹
EF (gha) of Cromwell visitor to Taieri GR	0.00006 ²
EF of 1,228 Cromwell visitors to Taieri GR	0.074
1. See Table 6.96	
2. See Table 5.74	

k. EF of Visitors to Gold Mining Towns

The total EF of 928 Cromwell visitors who visit gold mining towns is 0.06 gha (Table 6.108).

Table 6.108: Ecological footprint of Cromwell visitors (gold mining towns)	
Number of Cromwell visitors to Gold mining towns	928 ¹
EF (gha) of Cromwell visitor to Gold mining towns	0.00006 ²
EF of 928 Cromwell visitors to Gold mining towns	0.06
1. See Table 6.96	
2. See Table 5.75	

l. EF of Visitors to Old Cromwell Town

The EF of 2,652 Cromwell visitors to this town is 0.16 gha (Table 6.109).

Number of Cromwell visitors to old Cromwell town	2,652 ¹
EF (gha) of Cromwell visitor to old Cromwell town	0.00006 ²
EF of 2,652 Cromwell visitors to old Cromwell town	0.16
1. See Table 6.96	
2. See Table 5.76	

m. EF of Visitors to Friends and Relatives

The EF of 398 Cromwell visitors who visit friends and relatives is 0.08 gha (Table 6.110).

Number of Cromwell visitors to friends and relatives	398 ¹
EF (gha) of Cromwell visitor to friends and relatives	0.0002 ²
EF of 398 Cromwell visitors to friends and relatives	0.08
1. See Table 6.96	
2. See Table 5.78	

n. EF of Visitors on Clyde Dam Tour

The 16 Cromwell visitors who participate in a Clyde Dam Tour have an EF of 0.014 gha (Table 6.111).

Number of Cromwell visitors on Clyde Dam Tour	16 ¹
EF (gha) of Cromwell visitor on Clyde Dam Tour	0.0009 ²
EF of 16 Cromwell visitors on Clyde Dam Tour	0.014
1. See Table 6.96	
2. See Table 5.79	

o. EF of Visitors to Golden Progress Mine

The EF of visitors to the Golden Progress Mine is 0.001 gha (Table 6.112).

Number of Cromwell visitors to Golden Progress Mine	16 ¹
EF (gha) of Cromwell visitor to Golden Progress Mine	0.00006 ²
EF of 16 Cromwell visitors to Golden Progress Mine	0.001
1. See Table 6.96	
2. See Table 5.80	

p. EF of Visitors Fruit Picking Along Trail

The EF of 16 visitors fruit picking along the trail is 0.001 gha (Table 6.113).

Number of Cromwell visitors fruit picking along trail	16 ¹
EF (gha) of Cromwell visitor fruit picking along trail	0.00006 ²
EF of 16 Cromwell visitors fruit picking along trail	0.001
1. See Table 6.96	
2. See Table 5.81	

q. EF of Biking

The EF of 16 visitors biking as a tourist activity is 0.014 gha (Table 6.114).

Number of Cromwell visitors biking	16 ¹
EF (gha) of Cromwell visitor biking	0.0009 ²
EF of 16 Cromwell visitors biking	0.014
1. See Table 6.96	
2. See Table 5.66	

6.2.8.3. Total EF of Cromwell Visitor Activities

The total EF of Cromwell visitor activities as shown in Table 6.115 is 1.55 gha. Table 6.115 and Figure 6.51 demonstrate that the three largest EFs are the EF of sightseeing (0.73 gha), curling at Naseby and visiting old Cromwell town (0.16 gha) each and golf (0.1gha). Likewise, walking as a Cromwell visitor activity has the smallest EF of 0.0008 gha (Table 6.115 and Figure 6.51).

Table 6.115: Total EF of Cromwell visitor activities

Type of activity	Activities	Numbers of visitors per activity	% of total 2,652 Cromwell visitors	EF (gha/visitor)	EF (gha)	
Indoor activity	Curling at Naseby	979	36.9	0.00016	0.16	
Outdoor activities	Walking	16	0.6	0.00005	0.0008	
	Golf	34	1.3	0.04	0.1	
	Taieri	1,228	46.3	0.00006	0.074	
	Gold mining towns	928	35	0.00006	0.06	
	Sightseeing	812	30.6	0.0009	0.73	
	Old Cromwell town	2,652	100	0.00006	0.16	
	Wineries	448	16.9	0.00006	0.027	
	Visiting friends and relatives	398	15	0.0002	0.08	
	Hayes engineering	215	8.1	0.00006	0.013	
	Mountain biking at Naseby	66	2.5	0.0009	0.06	
	Fishing	50	1.9	0.0009	0.045	
	Swim at Ophir and Alexandra	16	0.6	0.0009	0.014	
	Clyde Dam Tour	16	0.6	0.0009	0.014	
	Golden progress mine	16	0.6	0.00006	0.001	
	Ophir high country farm	16	0.6	0.00006	0.001	
	Biking	16	0.6	0.0009	0.014	
	Fruit picking along trail	16	0.6	0.00006	0.001	
	Total		7,922	-	-	1.55

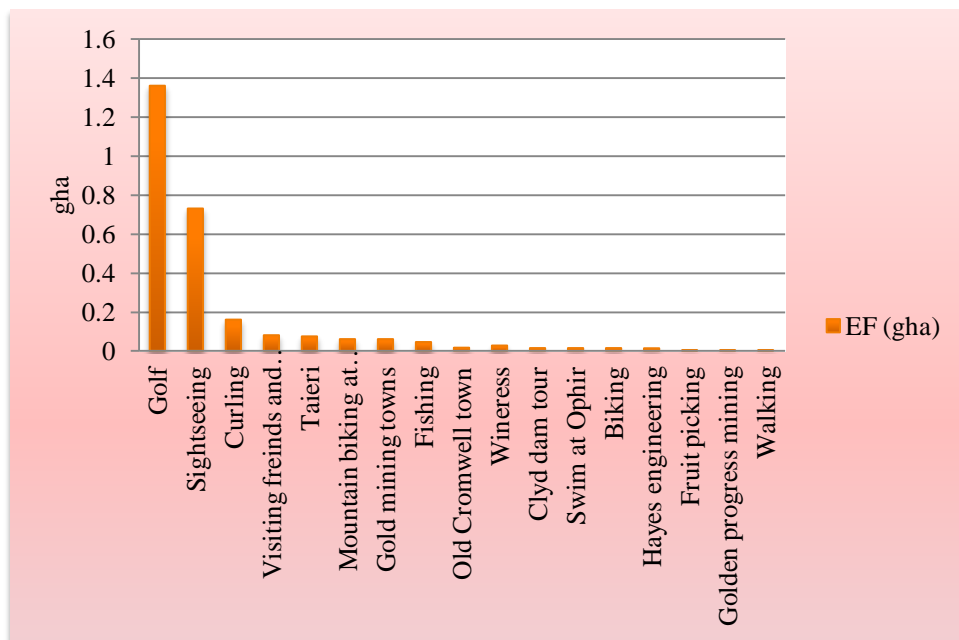


Figure 6.51: Cromwell - EF of visitor activities (2011)

6.2.8.4. Comparison between the EFs of Indoor and Outdoor Activities

Table 6.115 shows that 2,652 Cromwell visitors participated in 7,922 visitor activities. As a result the average number of activities per visitor is 2.98, so each Cromwell visitor engages in 2.98 activities proposed by the OCRT.

As shown in Table 6.116 and Figure 6.52, the EF of 979 Cromwell visitors (12.35% of 7,992 visitors activities) who participate in an indoor activity (curling at Naseby) is 0.16 gha and this accounts for 10.3 % of the total EF of Cromwell activities (indoor and outdoor). Furthermore, Table 6.116 and Figure 6.52 indicate that the total EF of 7,013 Cromwell outdoor visitor activities (87.75% of 7,992 Cromwell visitor activities) is 1.39 gha, or 89.7% of the total EF of Cromwell visitor activities (1.55 gha).

Indoor activity					Outdoor activities				
Numbers of visitor activities	% of 7,922 Cromwell visitor activities	EF (gha)	% total EF ¹	EF (gha/visitor)	Numbers of visitor activities	% of total Cromwell visitor activities	EF (gha)	% total EF ¹	EF (gha/visitor)
979	12.35	0.16	5.7	0.00016	7,013	87.75	1.39	89.7	0.0004

1. Percentage of the total 2.81gha EF of 7,992Cromwell visitor activities

- Total number of Cromwell visitors = 2,652 (see Table 6.67)
- Total number of Cromwell visitor activities = 7,992 (see Table 6.51)
- Average number of activities per visitor = 7,992 ÷ 2,652 = 2.98

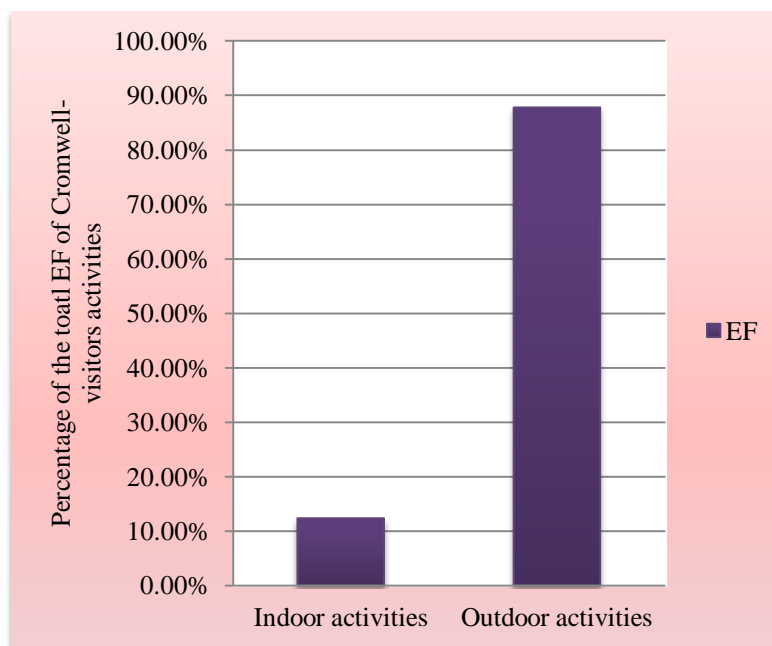


Figure 6.52: Comparison between EFs of Cromwell indoor and outdoor activities

This chapter selects curling as an indoor activity and golf as an outdoor activity with the biggest EF/visitor in their categories to be compared with walking as the outdoor activity with the smallest EF (Figure 6.53).

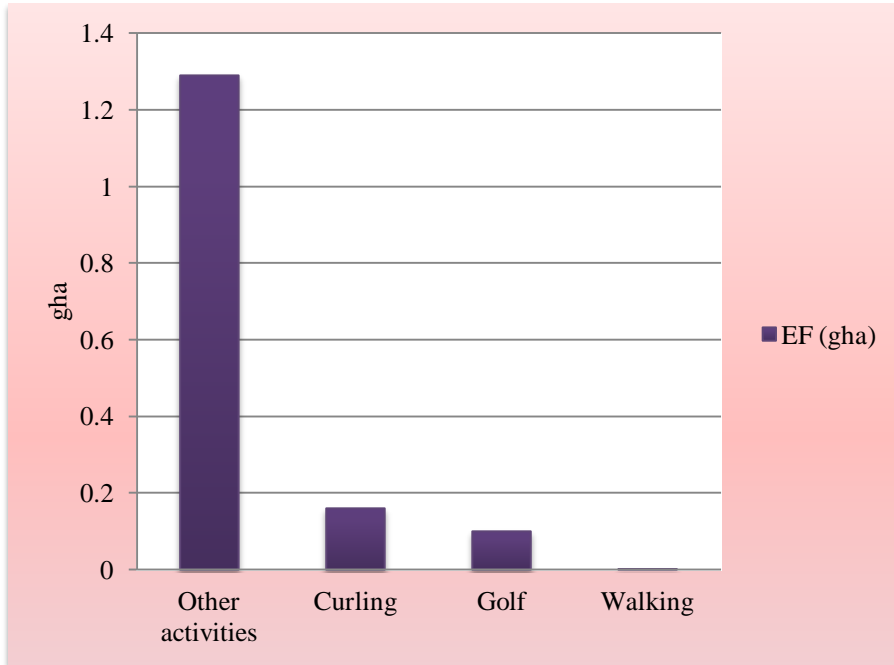


Figure 6.53: Cromwell - Comparison between EFs of golf, curling, walking, and other activities excluding these three

Figure 6.54 determines that the majority of 6,893 Cromwell visitor activities are within the ‘other activity’ category (excluding golfing, curling and walking) followed by curling (979), golfing (34) and walking (16).

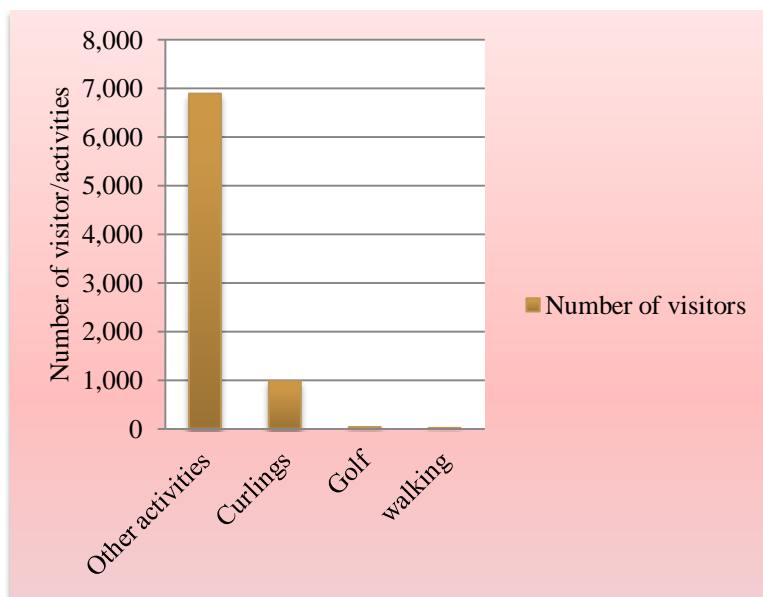


Figure 6.54: Cromwell - comparison between number of visitor activities for golf, curling, walking, and other activities

Since this study uses the same EF/visitor activity as explained in Chapter 5, comparison between the EF/visitor of the four categories in Figure 6.39 can be conducted through using Figure 5.36 (Chapter 5- section 5.7.5.4) with the same results.

6.2.9. The Total EF of Cromwell (2011)

Table 6.117 demonstrates that in 2011 the total EF of Cromwell visitors was 373.8gha. As shown in Table 6.117 and Figure 6.55 transportation accounts for the largest share of the total EF at 269.5gha (72.1%), followed by food at 94.71 gha (25.3%), accommodation services at 8.05 gha (2.2 %) and visitor activities at 1.55 gha (0.4%). In addition, the transportation EF that forms 72.1% of the total EF of Cromwell can be divided into 51.5% of international transportation and 49.5% domestic transportation (see Table 6.74).

Category	EF (gha)	%
Transportation	269.5 ¹	72.1
Food (second scenario)	94.71 ²	25.3
Accommodation (second scenario)	8.05 ³	2.2
Activities	1.55 ⁴	0.4
Total	373.8	100

1. See Table 6.74
 2. See Table 6.77
 3. See Table 6.92
 4. See Table 6.115

- Total number of Cromwell visitors (2011) = 2,652
- EF (gha/visitor) of Cromwell = 373.8 (gha) / 2,652 (visitors) = 0.14

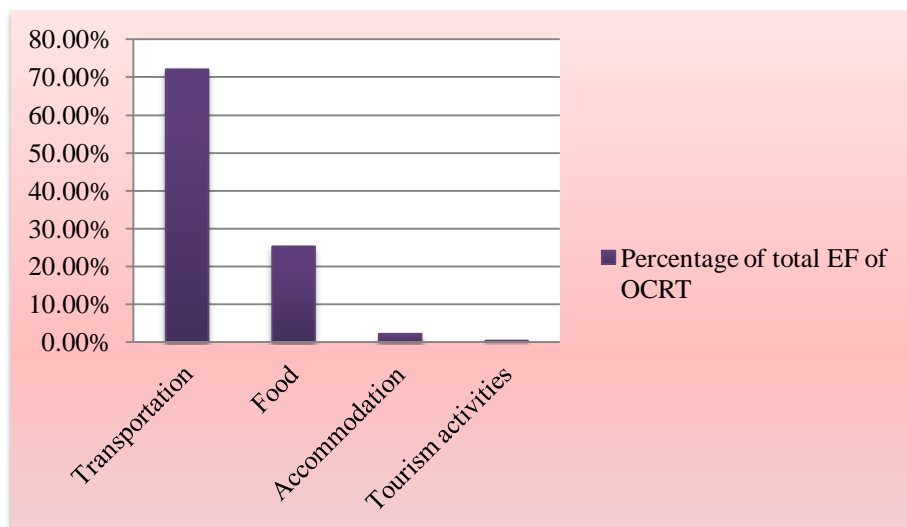


Figure 6.55: Comparison between EFs of Cromwell for transportation, food, accommodation services, and visitor activities (2011)

6.2.10. Cromwell Overshoot Portion of EF

Table 6.118 compares the present EF of Cromwell per visitor and the target EF (0.03gha) investigated in Chapter 5- section 5.9.1. As shown in this table the present EF of Cromwell at 0.14 gha/ visitor (see Table 6.118) is 0.11 gha/ visitor more than the target EF for sustainable living. Furthermore, the overshoot portion of the total EF of 2,652 Cromwell visitors as shown in Table 6.118 is $(2,652 \times 0.11) = 291.72\text{gha}$.

Table 6.118: Overshoot portion of Cromwell visitors EF (gha/visitor/year) (2011)

Now	Goal	Overshoot EF (gha/visitor/year)
0.14 ¹	0.03 ²	0.11

1. See Table 6.117

2. See Chapter 5-section.5.9.1 and Table s.5.85 - 5.86

- Total overshoot EF (gha) of 2,652 Cromwell visitors = $2,652 \times 0.11 = 291.72\text{ gha}$

6.2.11. Overshoot portion as Energy

6.2.11.1. Overshoot Portion of Energy Use per Visitor

This chapter calculates the overshoot portion of Cromwell visitors through using the method explained in Chapter 5- section 5.9.2. As shown in Table 6.120 the EF of Cromwell is 0.14 gha/ visitor and as a result energy use is equivalent to:

$$0.14 \text{ (gha/visitor)} \times 100 \text{ (carrying capacity of land)} = 14 \text{ (GJ/visitor)}$$

In addition sustainable energy use per visitor is:

$$0.03 \text{ (gha/visitor)} \times 100 \text{ (carrying capacity of land)} = 3 \text{ (GJ/visitor)}$$

The overshoot portion of Cromwell energy use is:

$$14\text{GJ/visitor} - 3 \text{ GJ/visitor} = 11\text{GJ/visitor (Table 6.119)}.$$

Table 6.119: Overshoot portion of Cromwell visitor energy use (GJ/visitor/year) (2011)

Now	Goal	Overshoot energy use (GJ/visitor/year)
14	3	11

6.2.11.2. Total Overshoot Portion of Energy Used

The total overshoot energy of Cromwell visitors can be calculated as the total number of visitors (2,652) multiplied by the overshoot energy use per visitor (11 GJ/visitor/year), which is 29,172 GJ/year (Table 6.120).

Table 6.120. Total overshoot portion of Cromwell visitor energy use (GJ/year) (2011)

Number of visitors	Overshoot energy use (GJ/visitor/year)	Total overshoot energy use (GJ/year)
2,652	11	29,172

6.2.11.3. Overshoot Portion of Energy Use by Categories

In this section, the overshoot portion of each category (transportation, food, accommodation and visitor activities) is calculated through using the equation explained in Chapter 5-section 5.9.3. As shown in Table 6.121, transportation uses the majority share of 21,033GJ/year overshoot energy, followed by food (7,380.5 GJ/year), accommodation services (641.8 GJ/year) and Cromwell visitor activities (116.7 GJ/year).

Table 6.121: Cromwell overshoot portion of energy used by categories (2011)

Category	EF (gha) ¹	% of total EF ¹	Overshoot portion of energy use (GJ/year)
Transportation	269.5	72.1	21,033
Food	94.71	25.3	7,380.5
Accommodation	8.05	2.2	641.8
Activities	1.55	0.4	116.7
Total	373.8	100	29,172 ²

1. See Table 6.118

2. See Table 6.120

6.2.12. Economic Footprint of Cromwell Rail Trail Visitors

In 2011, the total GDP of the OCRT was NZ\$6,245,289 (see Table 5.90) and GDP per visitor was NZ\$530 (NZ\$6,245,289 ÷ 11,788 OCRT visitors) (Table 6.122). This study uses this visitor GDP figure to calculate the GDP of Cromwell visitors in 2011. Table 6.122 determines that the total GDP of Cromwell rail trail visitors is NZ\$530 (GDP/visitor) × 2,652 (total number of Cromwell visitors) = NZ\$1,405,560

Table 6.122: Cromwell GDP (2011)

OCRT total GDP (NZ\$)	OCRT number of visitors	OCRT GDP (NZ\$/visitor)	Cromwell number of visitors	Cromwell total GDP (NZ\$) ³
6,245,289 ¹	11,788 ²	530	2,652	1,405,560

4. See Table 5.90

5. See Figure 5.2

6. $2,652 \times \text{NZ\$}530/\text{visitor} = \text{NZ\$}1,405,560$

The following table shows that the total overshoot energy of Cromwell visitors is 29,172 GJ/year. Since the cost to generate 1 GJ through using renewable resources is NZ\$19.8 (see Table 5.94), then the total cost that must be paid to generate 29,172 GJ/year is NZ\$577,605.6 (29,172 × NZ\$19.8) (Table 6.123). This means the sustainable

portion of Cromwell GDP is NZ\$1,405,560 (GDP) – NZ\$ 577,605.6 = NZ\$827,954.4 = 58.9% of total Cromwell GDP (Table 6.123 and Figure 6.56).

On the other hand the GDPs of Cromwell, as an ecological-economic indicator, shows that 41.1% (100%-58.9%) of Cromwell GDP must be paid to restore its environmental impacts to being ecologically sustainable. Furthermore, GDPs as a social-economic indicator evaluates the contribution of the Rail Trail to local economic development, through engagement of local participants and organizations (in this case accommodation services) in the development process.

Total Cromwell GDP (NZ\$)	1,405,560 ¹
Overshoot energy use (GJ/year)	29,172 ²
Energy cost (NZ\$/GJ) wind-solar	19.8 ³
Total cost (NZ\$) to generate overshoot portion of Cromwell energy by wind-solar systems	577,605.6
GDPs (NZ\$) ¹	827,954.4

1. See Table 6.122
 2. See Table 6.121
 3. See Table 5.94

- GDPs = Total GDP - Total cost to generate the overshoot portion of energy use through renewable resources (see Chapter 5- section.5.10.2).

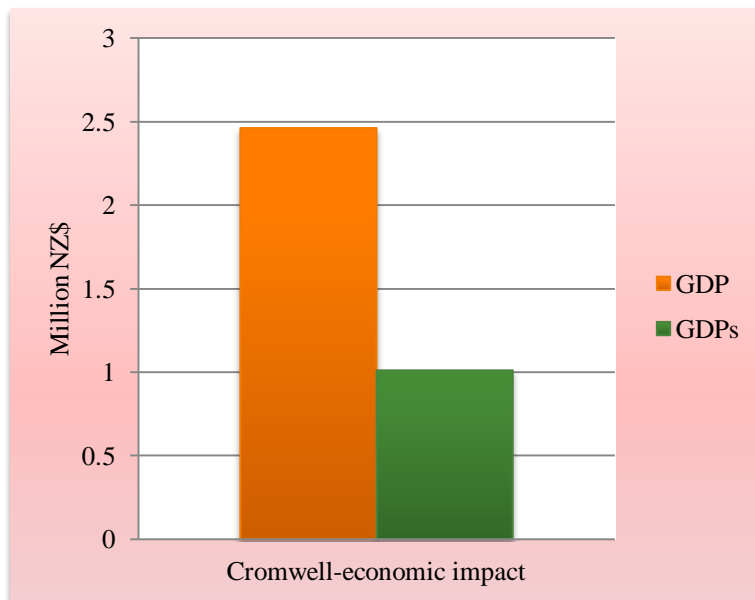


Figure 6.56: Cromwell - comparison between GDP and GDPs

6.2.13. Cromwell Cultural Footprint (CF)

This section uses the CF model explained in Chapter 4 to explore the cultural footprint of the OCRT on Cromwell as one of its host destinations. In this case study the CF of the Rail Trail in Cromwell is categorised into the three areas of food, accommodation and visitor activities and, as explained in Chapter 5, the CF of transportation is not included in this research.

6.2.13.1. Cromwell CF –Food

Table 6.124 contains the summarised results of two proposed scenarios for Cromwell food (sections 6.2.5.1 and 6.2.5.2). As shown in Table 6.124, the total conventional eaten out food in the first scenario is 17,662kg (100% of food consumed) and in the second scenario it is 17,662 made up of 17,222kg (97.5%) conventional food and 435 kg (2.5%) home prepared (organic food). As a result, the total EF of Cromwell food in the first scenario is 95.47 gha/year and in the second scenario this reduces to 94.71 gha/year (Table 6.124).

Table 6.124 indicates that in the second scenario the overshoot portion of the energy value of the food consumed is equivalent to 7,380.5 GJ/year. Since the EF of food in the first scenario (EF1) is 0.76 gha larger than that of the second scenario (EF2), the overshoot energy value of food consumed in the first scenario is 76 GJ ($0.76 \text{ gha} \times 100$ – global average carrying capacity of land). This is bigger than the overshoot portion of the energy value of food in the second scenario (7,380.5 GJ/year). Consequently the overshoot energy value of food in the first scenario is $7,380.5 \text{ GJ} + 76 \text{ GJ} = 7,456.5 \text{ GJ/year}$ (Table 6.124).

In this section, the overshoot portions of EF1 of 74.56 gha (see Table 6.124) and EF2 of 73.80 gha (see Table 6.124) is calculated using the method explained in Chapter 5- section.5.11.1. As the cost to generate 1GJ energy using wind-solar systems is NZ\$19.8, the cost to generate 7,456.5 GJ/year (overshoot portion of energy value of food in the first scenario) is $7,456.5 \text{ GJ} \times \text{NZ\$}19.8 = \text{NZ\$}147,638.7$ (see Table 6.124). Likewise the total cost to generate the overshoot energy using wind-solar systems in the second scenario is $\text{NZ\$}19.8 \times 7,380.5 \text{ /year} = \text{NZ\$}146,133.9$ (Table 6.124).

The total GDP of Cromwell food is calculated using the GDP/kg food of OCRT multiplied by total Cromwell food consumed (kg). As the total GDP for food related to the OCRT is NZ\$782,795 (see Table 5.91) and total produced/consumed food is 78,508.45 kg, the GDP of food related to OCRT per kilogram is equal $NZ\$782,795 \div 78,508.45 \text{ kg} = 9.97 \sim NZ\$10/\text{kg}$.

In Cromwell the total amount food consumed is 17,662 kg (see Table 6.125). As a result the GDP of Cromwell food is equivalent to $17,662 \text{ (kg)} \times NZ\$10/\text{kg of food} = NZ\$176,620$ (Table 6.124). Table 6.124 shows the GDP associated with food for both scenarios is NZ\$176,620. As a result:

$GDPs_1 = NZ\$176,620 \text{ (GDP)} - NZ\$147,638.7 \text{ (renewable energy cost)} = NZ\$ 28,981$;

$GDPs_2 = NZ\$176,620 \text{ (GDP)} - NZ\$146,133.9 \text{ (renewable energy cost)} = NZ\$ 30,486$.

The difference between GDPs₁ and GDPs₂ shows the NZ\$1,505 contribution to GDPs from producing 435 kg home prepared (organic) food by Cromwell accommodation services. In addition, it can be considered that producing 1kg home prepared (organic) food contributes NZ\$3.46 to GDPs (Table 6.124).

Table 6.124: Cromwell - local product (food) contribution to GDPs

First scenario (100% conventional food)		Second scenario (97.5% conventional food and 2.5% home prepared (organic) food)	
Total conventional eaten out food (kg)	17,662 ¹	Total conventional eaten out food (kg)	17,222 ¹
Total home prepared food (kg)	0.00	Total home prepared food (kg)	435 ¹
Total EF of consumed food gha/year – (EF1)	95.47 ¹	Total EF of consumed food gha – (EF2)	94.71 ¹
Overshoot portion of energy related to food (GJ/year)	7,456.5	Overshoot portion of energy related to food (GJ/year)	7,380.5 ²
Overshoot portion of EF1 (gha/year)	74.56	Overshoot portion of EF2 (gha/year)	73.80
Cost to generate 1GJ energy using wind-solar systems (NZ\$)	19.8	Cost to generate 1GJ energy using wind-solar systems (NZ\$)	19.8
Total cost to generate overshoot energy using wind-solar systems (NZ\$)	147,638.7	Total cost to generate overshoot energy using wind-solar systems (NZ\$)	146,133.9
Total food GDP (NZ\$)	176,620	Total food GDP (NZ\$)	176,620
Total food GDPs1	28,981	Total food GDPs2	30,486
1. See Table 6.78 2. See Table 6.121 • Increased portion of GDPs influenced by using 435 kg home prepared food = NZ\$1,505= NZ\$3.46/kg			

a. Ideal Sustainable Life Model: Food

Table 6.124 shows that the present EF2 of Cromwell food (second scenario) is 94.71 gha and the overshoot portion of EF2 is 73.80 gha. As a result the sustainable EF of Cromwell food can be determined through the following equation:

$$94.71 \text{ gha (EF2, present EF)} - 73.80 \text{ gha (overshoot portion of EF2)} = 20.91 \text{ gha.}$$

In the ideal model for Cromwell tourist related food, since the overshoot portion of energy use is zero, the GDPs is equal to the total GDP of Cromwell food (NZ\$176,620, see Table 6.124). This section uses the ideal model of Cromwell food and compares it with the two scenarios shown in Table 6.124.

In Figure 6.57, the area of ‘Q1, EF1, and GDPs1’ illustrates ordinary life; this is the area in which all Cromwell visitors consume 100% (17,662 kg) conventional eaten out food (first scenario). In this area, development of the Rail Trail (OCRT) does not exert any influence on Cromwell (as one of the host destinations) and its visitors to produce and consume local foods. In Figure 6.57 the EF of using 100% conventional food (EF1) is 95.47 gha/year and this represents the total food EF. In the ordinary life area, GDPs1 is equal to NZ\$ 28,981 (see Table 6.124).

Comparison between the first scenario and the ideal model of Cromwell food consumption indicates that in the first scenario EF1 (95.47 gha) is 78.09 % (74.56 gha) bigger than the ideal EF (20.91gha) (Figure 6.57 and Table 6.124). As shown in Figure 6.57, in the first scenario, GDPs1 is equal to 16.4 % of the total GDP of Cromwell food. On the other hand, 83.6% (100 – 16.4%) of total GDP related to food must be spent to change EF1 to the ideal EF through generating the overshoot portion of food energy by using wind-solar systems.

In Figure 6.42, the area of ‘Q2, EF2, and GDPs2’ determines the CF area of Cromwell for producing and consuming home prepared (organic) foods. As demonstrated in Figure 6.57 total Q2 in the CF for food consumed by Cromwell visitors (17,662 kg) is divided into the two portions of 2.5% (435kg) home prepared food (Q3) and 97.5% (17,222kg) conventional eaten out food (Q4). The EF in the CF (EF2) contains the EF of using 2.5% (435kg) home cooked and 97.5% (17,222 kg) conventional eaten out foods. The GDPs2 in the CF is equal to NZ\$30,486 which is NZ\$1,505 (.085% of the total GDP) more than GDPs1 (NZ\$ 28,981) (Table 6.124).

Figure 6.57 and Table 6.124 indicate that using 2.5% home prepared (organic) food reduces total Cromwell food EF by 0.79% (shown in Figure 6.57 as R-EF1). As demonstrated in this figure, producing 2.5% local food increases GDPs1 by 0.85%, shown in the figure as (I) GDPs 1.

Comparison between the ideal model and present pattern of Cromwell food consumption demonstrates that EF2 (94.7 gha) is 73.79 gha (77.3 % of EF1 as benchmark) more than ideal EF (20.91gha), and 83.6 % (NZ\$147,638.7) of the GDP (NZ\$176,620) of food must be spent to reduce this overshoot portion of EF2 to the ideal EF (Table 6.124 and Figure 6.57).

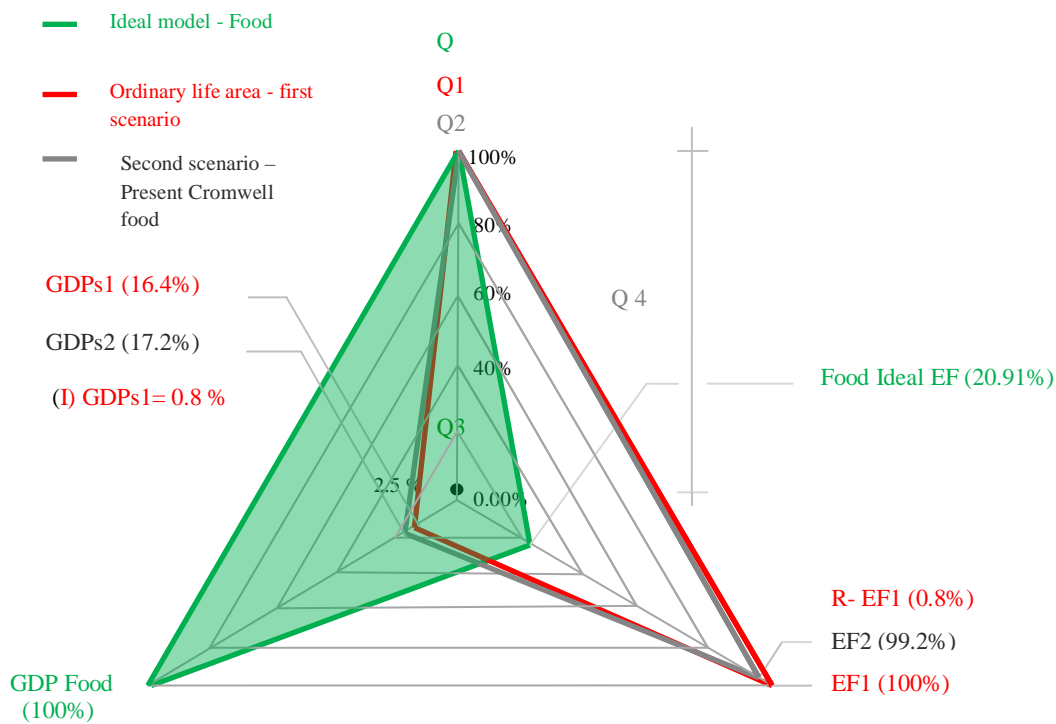


Figure 6.57: The cultural footprint (CF) of Cromwell visitor food

- Q: 100% food in Ideal model
- Q1: 100% conventional eaten out food – first scenario
- Q2: 97.5% conventional eaten out food + 2.5% home prepared food – second scenario
- Q3: 2.5% home prepared food (second scenario)
- Q4: 97.5% conventional eaten out food (second scenario)
- GDPs1: sustainable portion of GDP – first scenario
- GDPs2: sustainable portion of GDP – second scenario
- (I) GDPs1: Increased portion of GDPs1
- EF1: ecological footprint of consumed food – first scenario
- EF2: ecological footprint of consumed food – second scenario
- R- EF1: reduced portion of total EF1 of consumed food

6.2.13.2. The CF of Cromwell Accommodation Services

This section explores the CF of 492 Cromwell accommodation services (all NB) through using two scenarios contain different quantities, EFs and GDPs of the accommodation services used. In the first scenario, all buildings are assumed not to have open air areas (veranda/balcony). In the second scenario 57.2 m² (0.2%) of a total area of 25178m² accommodation services area is outdoor sitting space (V/B) (Table 6.91).

Table 6.125 shows that in the first scenario the total EF of using 100% buildings as accommodation services is 8.11 gha. In this Chapter, the GDP of Cromwell's accommodation services with its total 9,547 visitor nights is calculated using the same method explained in section 6.1.13.2.

Since the overshoot portion of energy use in the second scenario has already been calculated as 627.2 GJ (see Tables 6.125 and 6.121), it is used here as a base to calculate the overshoot energy of the first scenario through the method explained in Chapter 5-section-5.11.2. Table 6.125 shows that the overshoot portions of energy for accommodation services in the first and the second scenarios are 633.6 GJ and 627.2 GJ respectively.

Table 6.125 contains the total costs to generate the overshoot energy related to each of the two scenarios. These costs are calculated through using the method explained in Chapter 5-section.5.11.2. As shown in Table 6.125, the costs to generate the overshoot energy of the first and second scenarios in an environmentally sustainable way are NZ\$12,545, and NZ\$12,418.56 respectively.

In this section, the GDPs of the two scenarios cited in Table 6.125 are calculated based on the method used in Chapter 5-section.5.11.2 for the GDPs of OCRT accommodation services. Table 6.125 determines that the GDPs of the second scenario (GDPs2) is the larger at NZ\$1,625,893 compared to NZ\$625,893.86 (GDPs1).

Table 6.125: Cromwell accommodation services - CF (2011)

First scenario		Second scenario	
All Cromwell accommodation assumed as indoor area		Accommodation areas contain V/B	
Total number of accommodation services	492 ¹	Total number of accommodation services	492 ¹
Accommodation area (indoor spaces) (m ²)	25,178 ¹	Accommodation area (indoor spaces)	25,120.8 ¹
Accommodation area (V/B) (m ²)	0.00	Accommodation area (V/B)	57.2 ²
Total EF (EF1) (gha)	8.11 ²	Total EF (EF2) (gha)	8.046 ³
GDP (NZ\$)	638,312.42 ⁴	GDP (NZ\$)	638,312.42 ⁴
Overshoot energy use (GJ/year)	633.6	Overshoot energy use (GJ/year)	627.2 ⁵
Cost to generate 1 GJ energy using wind-solar systems (NZ\$)	19.8 ⁶	Cost to generate 1 GJ energy using wind-solar systems (NZ\$)	19.8 ⁶
Cost to generate 625.8 GJ energy using wind-solar systems (NZ\$)	12,545.28	Cost to generate 575.8 GJ energy using wind-solar systems (NZ\$)	12,418.56
GDPs1	625,767.14	GDPs2	625,893.86
1. See Table 6.83 2. See Table 6.89 3. See Table 6.92 4. See Table 5.37 5. See Table 6.121 6. See Table 5.94			

a. Sustainable Living Cromwell Accommodation Services (Ideal Model)

This section determines an ideal model for Cromwell accommodation services in which its EF is considered environmentally sustainable and its GDPs is equal to the total GDP of Cromwell accommodation services. This model is then used to compare each of the two scenarios for Cromwell accommodation services (cited in Table 6.125) with an environmentally and economically sustainable pattern of accommodation.

a. 1. Sustainable EF

As shown in Table 6.125 the total overshoot energy of Cromwell accommodation services at present is 627.2 GJ/year. As a result the overshoot portion of its EF is $627.2/100 = 6.27$ gha. As indicated in Table 6.125, the present EF of Cromwell is 8.046 gha (EF2). Consequently the environmentally sustainable EF can be considered as $8.046 \text{ gha} - 6.27 = 1.79$ gha.

a. 2. Sustainable Living: GDPs

As explained in section 6.1.13.2, a.2, the GDPs of Cromwell accommodation in sustainable living is equal with its total GDP.

b. Comparison between the Ideal Model, First and Second Scenarios

Figure 6.58 comprises the quantities, EFs and GDPs(s) of Cromwell accommodation services arising from the Ideal model, first, and second scenarios discussed above. This figure makes this an opportunity to explore the ecological and economic influences exerted by using 57.2 m² (0.2% of the total 25,178 m², see Table 6.125) of accommodation area as open air areas (V/B).

As shown in Figure 6.58, in the Ideal model of accommodation services, Q is the 100% Cromwell accommodation services area (25,178 m²) with an EF of 1.79 gha and GDPs of NZ\$638,312.42 (equal to total accommodation GDP). In the ideal model as discussed above, the overshoot portion of the EF and energy use are zero. In first scenario, Q1 is the total area of Cromwell accommodation services (25,178 m²) where 100% of accommodation buildings are assumed to be indoor spaces (Figure 6.58). In the second scenario as illustrated in Figure 6.58, Q2 represents the Cromwell accommodation area (25,178 m²) divided into two portions of 99.8% (25,120.8 m², see Table 6.126) indoor spaces and 0.2% (57.2 m², see Table 6.125) V/B.

In Figure 6.58, EF1 is the biggest EF in comparison with the EFs of the other scenarios and is here considered to be the 100% benchmark. Likewise, in this figure, EF2 and Ideal-EF are compared with EF1 as the 100% benchmark.

As shown in Figure 6.58, in the ideal model of Cromwell accommodation services, the acceptable EF of these services is 22.07% of EF1 (8.11gha, see Table 6.125). On the other hand, in the first scenario in which all buildings are assumed as indoor space, the EF (EF1 = 8.11gha) is 77.93% (6.32 gha) larger than the sustainable EF (1.79 gha) (Figure 6.58).

As illustrated in Figure 6.58, the EF of Cromwell accommodation services in the second scenario (EF2 = 8.046 gha, see Table 6.126) is 99.2% of EF1 (8.11gha, see Table 6.125). Consequently (R) EF1 is equal to 0.8% of EF1= 0.065 gha (Figure 6.58).

GDPs1 (GDPs of the first scenario = NZ\$625,767.14) is equal to 98.03% of total GDP of Cromwell accommodation services (NZ\$638,312.42) (Figure 6.58). On the other hand, in the first scenario 1.97% (NZ\$12,545.28) of the total GDP of Cromwell ac-

commodation services must be spent to generate the overshoot portion of accommodation energy use through wind-solar systems to change EF1 to the ideal EF.

As shown in Figure 6.58, GDPs 2 (NZ\$625,893.86, the GDPs of the second scenario) is 98.05% of the total GDP of Cromwell accommodation (NZ\$638,312.42) and 1.95% (NZ\$12,418.56) of the total GDP of Cromwell accommodation services must be spent to generate the overshoot portion of associated energy use through using wind-solar systems to reduce EF2 to the ideal EF. Likewise, as determined in Figure 6.43, (I) GDPs1 is equal to 0.02% of the total GDP of Cromwell accommodation services. This means using V/B (open air areas) as 0.2% of accommodation area contributes to an increase of 0.02% in GDPs1.

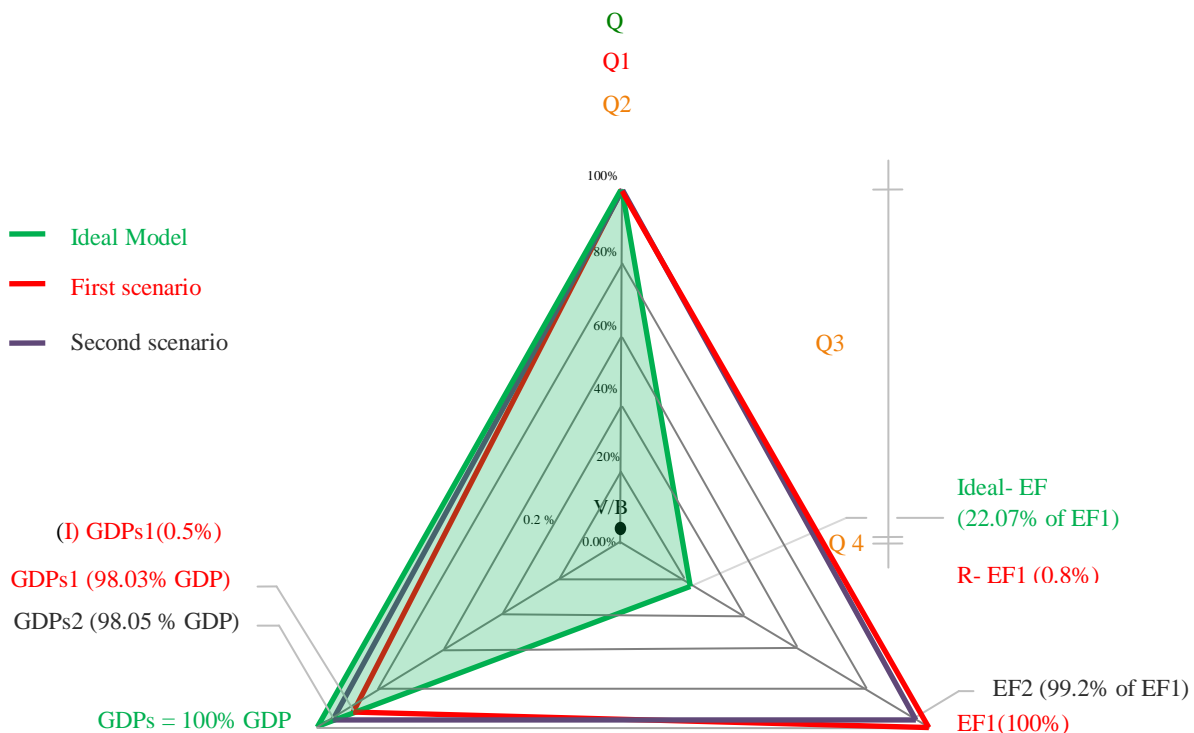


Figure 6.58: The CF of Cromwell accommodation services with V/B as part of the used spaces

- Q: (100%) area of 492 Cromwell accommodation services (25,178m²) – Ideal model
- GDP: GDP of Cromwell accommodation services NZ\$1,638,312.42 (see Table 6.126)
- GDPs: Total sustainable portion of Cromwell accommodation services – Ideal model
- Q1: Total (100%) area of Cromwell accommodation services (25,178m²) – all buildings area assumed as indoor spaces (first scenario)
- EF1: Total EF of Cromwell accommodation services (first scenario)
- (R) EF1: Reduced portion of Cromwell EF1 influenced by using V/B as part of buildings
- GDPs1: Total GDPs of Cromwell accommodation services (first scenario)
- (I) GDPs1: Increased portion of GDPs1 influenced by using V/B as part of buildings
- Q2: Area Cromwell accommodation services (25,178m²) including; 99.08% (25,120.8 m²) indoor spaces and 0.2% (57.1m²) V/B (second scenario)
- Q3: 99.08% (25,120.8m²) total indoor area of 492 Cromwell accommodation services (second scenario)

Q 4 (V/B area): 0.2% (57.2m²) of total Cromwell accommodation area (second scenario)
EF2: EF of 25,178m² Cromwell accommodation services (Q2) including EFs of Q3 and Q 4 (present EF)
(R) EF1: Reduced portion of Cromwell EF1 influenced by using V/B
GDPs2: Total GDPs of Cromwell accommodation services (second scenario)

6.2.13.3. The CF of Cromwell Visitor Activities

a. Overshoot EF of Cromwell Visitor Activities

As shown in Table 6.126, the category of other activities accounts for the largest portion at 83.2 % (1.29 gha) of the total EF of Cromwell visitor activities (1.55 gha) followed by curling (10.3 %), golf (6.45%) and walking (0.05%). Table 6.126 shows that the total overshoot portion of the EF of Cromwell activities is 1.167 gha (see also Table 6.121). The overshoot portion of the EFs of the four activity groups above are calculated through using same method explained in section 6.1.13.3- a. As shown in Table 6.126, in comparison with other categories the category of other activities has the largest overshoot EF of 0.97 GJ, followed by 0.12 GJ curling, golf 0.075 and 0.0006 GJ walking.

b. Cromwell Activities GDP

The GDP of Cromwell activities are calculated through using the method explained in section 6.1.13.3- b. Table 6.126 demonstrates that of the NZ\$450,603 GDP of Cromwell activities (7,922 visitor activities × NZ\$56.88 GDP/visitor activity), the largest portion of NZ\$392,074 is the GDP of other visitor activities, followed by NZ\$55,686 (curling), NZ\$ 1,934 (golf) and NZ\$910 walking.

c. Cromwell Activities GDPs

Table 6.126 comprises the overshoot EFs of the four categories of curling, golf, walking and other activities that are calculated though using the equation explained in section 6.1.13.3- b.

In Table 6.126, the overshoot energy use of each category is calculated as its overshoot EF multiplied by 100 GJ/gha (global average carrying capacity of land). Also as shown, other activities has the largest overshoot of 97 GJ, followed by curling (12GJ), golf (7.5) and walking (0.06GJ).

This section calculates the cost to generate the overshoot portion of the energy of each category of Cromwell activities through using the method explained in Chapter 5- section 5.10.2.

Table 6.126 contains the total cost that must be paid to generate the overshoot energy of each type of Cromwell activity through using wind-solar systems. As presented in Table 6.126, other activities (excepted curling, golf and walking) has the largest cost of NZ\$1,921 and walking the minimum cost (\$NZ1~ 0.00) to generate the overshoot energy in a sustainable way. The total cost of Cromwell activities overshoot energy as shown in Table 6.126 is \$NZ 2,309.

The GDPs of each category of Cromwell visitor activities (GDP – cost of overshoot energy used) are set out in Table 6.126. As determined in Table 6.126 other activities has the largest GDPs of NZ\$390,153 and the GDPs of other categories including curling, golf and walking are in a range of NZ\$909 – NZ\$55,448. In addition, the total GDPs of Cromwell’s visitor activities is NZ\$448, 296, equivalent to 99.48 % of its total GDP (\$NZ450, 603) (Table 6.126).

Table 6.126: Cromwell visitor activities - EF and GDPs

Category	Number of visitors/acti- vity	EF ¹ (gha)	%	Overshoot EF (gha)	Overshoot energy (GJ) ²	GDP (NZ\$)	Cost of overshoot energy (NZ\$)	GDPs (NZ\$)
Golf	34	0.1	6.45	0.075	7.5	1,934	148.5	1,786
Curling	979	0.16	10.3	0.12	12	55,686	238	55,448
Walking	16	0.0008	0.05	0.0006	0.06	910	1	909
Other	6,893	1.29	83.2	0.97	97	392,074	1,921	390,153
Total	7,922	1.55	100	1.167 ³	116.7	450,603	2,309	448,296

1. See Figure 5.34 and Table 5.82

2. Total overshoot energy use of activities = 116.7 GJ/year (see Table 6.121)

• Average GDP of OCRT visitor activity = Total GDP of OCRT activities/visitor activity = 1483,180 ÷ 26,077 = NZ\$56.88 (see Chapter 5: Table 5.98)

d. CF: Ideal Model for Sustainable Activities and the Three Scenarios

This chapter proposes three scenarios for the CF of Cromwell visitor activities (illustrated in Figure 6.59) and compares the areas generated with each other and the sustainable area (Ideal model) of these activities (shown as the green area in Figure 6.59).

d.1. Cromwell Visitor Activities (Ideal model)

As shown in Table 6.126, the present EF of Cromwell visitor activities is 1.55 gha and its overshoot EF is 1.167 gha. The EF of the Ideal model for Cromwell visitors activities (zero overshoot EF) is 1.55gha – 1.167 gha = 0.38gha. This means the ecologically sustainable EF of Cromwell visitors activities (0.38 gha) is 24.5% of its present EF (EF1= 1.55gha).

In addition, in the sustainable area of Cromwell visitors’ activities, as the cost of overshoot energy is zero, its GDPs is equal to 100% of the GDP of Cromwell visitor activities (\$NZ450,603, see Table 6.126).

d.2. Cromwell Visitor Activities (First Scenario)

The present CF of Cromwell visitor activities is the same as the first scenario shown in Figure 6.59. In the first scenario the total number of visitor activities (7,922) comprises 6,893 visitors doing other activities, 979 visitors curling, 34 visitors playing golf, and 16 visitors walking (see Table 6.127).

The total EF of Cromwell visitors activities (EF1) in the first scenario is 1.55 gha (see Table 6.126) and this is used as the 100% benchmark when comparing this with the second scenario and the Ideal model (see Figure 6.59). As shown in Figure 6.59 and Table 6.126 in the first scenario GDPs1 (present situation, Table 6.126) is equal to 99.48 % (NZ\$448,296) of the total GDP of Cromwell visitor activities (NZ\$ 450,603).

d.3. Cromwell Visitor Activities (Second Scenario)

The second scenario is proposed based on the assumption that the 34 visitors who play golf in the first scenario choose walking instead (see Table 6.127). In the second scenario, walking is assumed to have an EF of 0.00005gha/visitor, see Table 5.82).

Table 6.127: The CF of Cromwell visitor activities - first and second scenarios

First scenario				Second scenario			
Category	NV ⁴	EF/visitor	EF1	Category	NV	EF (gha/visitor)	EF2 (gha)
Golf	34	0.003 ¹	0.1	-	-	-	-
Curling	979	0.00016 ²	0.16	Curling	979	0.00016 ²	0.16
Walking	16	0.00005 ³	0.0008	Walking	50	0.00005 ³	0.0025
Other	6,893	0.00025	1.29	Other	6,893	0.00025	1.29
Total	7,922	-	1.55	Total	7,922	-	1.45

1. See Table 5.58
 2. See Table 6.35
 3. See Table 5.56
 4. NV: Number of visitor activities (see Table 6.96)

As shown in Table 6.127 and Figure 6.59 in comparison with the first scenario, in the second scenario EF2 is reduced by 1.45gha compared to EF1 (1.55 gha), a 6.45 % (0.1gha) reduction just from 34 visitors changing their activity from golfing to walking. In addition, the overshoot portion of the EF of Cromwell activities that in the first scenario is 1.167 gha (see Table 6.126) in the second scenario is reduced to (1.167 gha –

0.1 gha) 1.067 gha. As a result the overshoot energy of Cromwell activities in the second scenario is $1.067 \text{ gha} \times 100$ (carrying capacity of land) = 106.7 GJ. Likewise, the total cost to generate the overshoot energy of Cromwell visitor activities in the second scenario is:

$106.7 \text{ GJ (overshoot portion of energy)} \times \text{NZ\$}19.8$ (cost to generate 1GJ energy using wind-solar systems) = NZ\$2,113.

Since the total GDP of Cromwell visitor activities is NZ\$450,603 (Table 6.126), the GDPs of the second scenario is NZ\$450,603 (GDP) - NZ\$2,113 (the total cost to generate overshoot energy in the second scenario) = NZ\$448,490 = GDPs2. As shown in Figure 6.59, GDPs2 is 99.53% of the total GDP of Cromwell visitor activities (NZ\$450,603) and (I) GDPs2 is GDPs2 (99.53% of GDP) – GDPs1 (99.48 % of GDP) = 0.05 % of GDP (NZ\$450,603) = NZ\$225.

d. 4. Comparison between Ideal Model and First and Second Scenarios

In comparison with the EFs of the two scenarios (EF1 and EF2), the EF of the Ideal model (0.38 gha, see section 6.2.13.3.4-a) is 24.5% of EF1 (1.55 gha) and 26.2 % of EF2 (1.45 gha, see Table 6.127) (Figure 6.59). The proposed CF model in Figure 6.59 determines that for changing EF1 (1.55 gha) to the ideal EF (0.38), 0.45% (NZ\$2,309) of the total GDP of Cromwell visitor activities must be spent to generate the overshoot portion of its energy. Also, the model (Figure 6.59) indicates that for changing the EF of Cromwell visitor activities in the second scenario (EF2) to a sustainable EF, 0.49 % (NZ\$2,218) of the total GDP of Cromwell visitor activities (NZ\$450,603) must be spent to reduce the environmental impact.

d. 5. Cromwell Visitor Activities (Third Scenario)

The third scenario is proposed based on the assumption that 34 visitors who play golf and 979 visitors who play curling in the first scenario (see Table 6.126) choose walking as their activity instead (see Table 6.128).

As shown in Table 6.128 and Figure 6.59, in comparison with the first scenario, in the third scenario, the EF3 is reduced by 86.45% (1.34 gha) compared to EF1 (1.55gha). Furthermore, the difference between EF2 and EF3 (1.45 – 1.34= 0.11gha) that is equal to 7.09 % of EF1 (100% of EF) determines the reduced portion of EF2 influenced by

changing curling and golfing for walking at Cromwell. This portion (7.09 %) is shown as (R) EF2 in Figure 6.59.

As shown in Table 128, EF3 (1.34) compared with EF1 (1.55) is reduced 0.21 gha (1.55gha- 1.34gha). In addition, the overshoot portion of the EF of Cromwell activities that in the first scenario is 1.167 gha (see Table 6.126) in the third scenario is reduced to (1.167gha – 0.21 gha) 0.96 gha. As a result the overshoot energy use of Cromwell activities in the third scenario is equal to 0.96 gha × 100 (carrying capacity of land) = 96 GJ. Likewise, the total cost to generate the overshoot energy used in third scenario is equal to:

96 GJ (overshoot portion of energy use) × NZ\$19.8 (the cost to generate 1GJ energy using wind-solar systems) = NZ\$1,900.

Since the total GDP of Cromwell visitor activities is NZ\$450,603 (see Table 6.126) consequently, the GDPs of the third scenario is NZ\$450,603 (GDP) - NZ\$1,900 (the total cost to generate overshoot energy in the third scenario) = NZ\$448,703= GDPs3. As shown in Figure 6.59, GDPs3 is 99.58 % of the total GDP of Cromwell visitors activities and (I) GDPs2 is GDPs3 – GDPs2 = 0.05% of GDP (NZ\$450,603) = NZ\$225.

d. 6. Comparison between the Ideal Model and the Third Scenario

As Figure 6.59 illustrates, the EF of the Ideal model (0.38 gha, see section 6.2.13.3.4-a) is 28.4% of EF3 (1.34 gha, see Table 6.128). The proposed CF model in Figure 6.59 determines that for changing EF3 (1.34gha) to the ideal EF (0.38), 0.4 % (\$NZ1,900) of the total GDP of Cromwell visitor activities must be spent to generate the overshoot portion of its energy.

Table 6.128: The CF of Cromwell visitor activities - first and third scenarios

First scenario				Third scenario			
Category	NV ⁴	EF (gha/visitor)	EF1 (gha)	Category	NV	EF (gha/visitor)	EF3 (gha)
Golf	34	0.003 ¹	0.1	-	-	-	-
Curling	979	0.00016 ²	0.16	-	-	-	-
Walking	16	0.00005 ³	0.0008	Walking	1,029	0.00005 ³	0.051
Other	6,893	0.00025	1.29	Other	6,893	0.00025	1.29
Total	7,922	-	1.55	Total	7,922	-	1.34

1. See Table 5.58
 2. See Table 6.35
 3. See Table 5.56
 4. NV: Number of visitor activities (see Table 6.96)

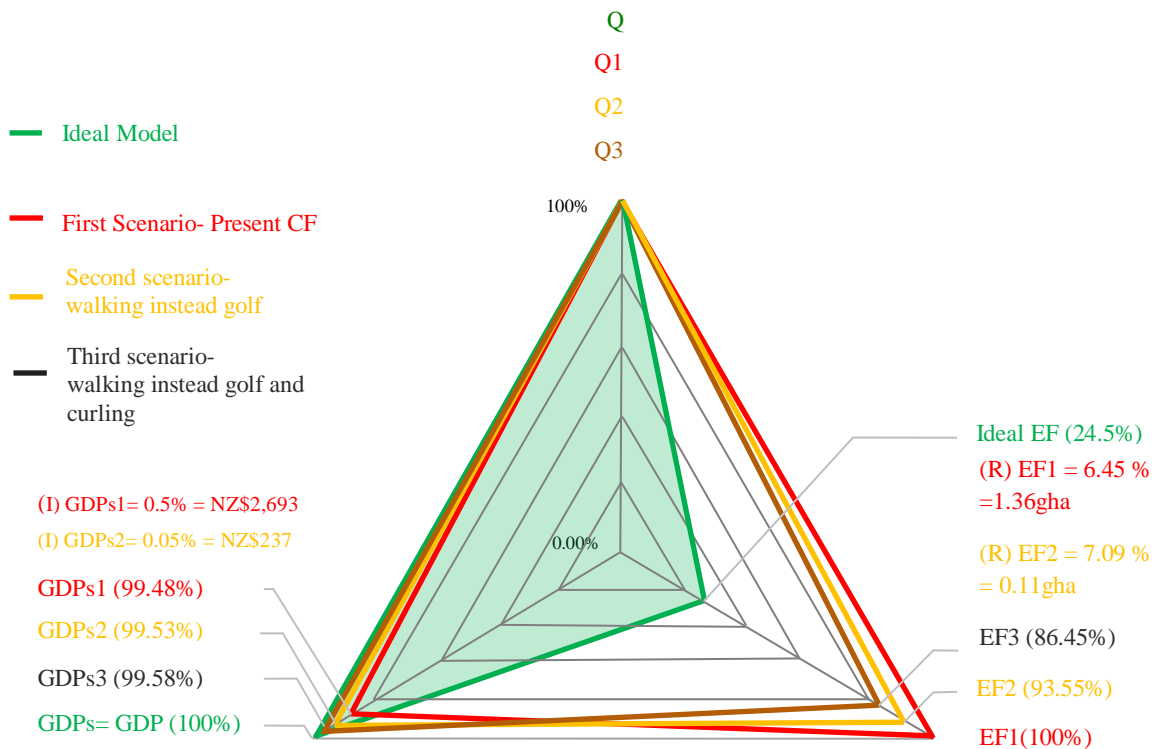


Figure 6.59: The CF of Cromwell visitor activities

- Q: 100% of Cromwell visitor activities in Ideal model
- Q1: 100% of Cromwell visitor activities first scenario (present)
- Q2: 100% of Cromwell visitor activities second scenario (walking instead golfing)
- Q3: 100% of Cromwell visitor activities third scenario (walking instead golfing and curling)
- EF1: The EF of Cromwell visitor activities first scenario (present EF)
- EF2: The EF of Cromwell visitor activities second scenario
- EF3: The EF of Cromwell visitor activities third scenario
- (R) EF1: Reduced portion of EF1 influenced by changing golf for walking
- (R) EF2: Reduced portion of EF2 influenced by changing golfing and curling for walking
- GDP: The GDP of Cromwell visitor activities
- GDPs: The GDPs of Ideal model for visitor activities = GDP
- GDPs1: The GDPs of Cromwell visitor activities first scenario
- GDPs2: The GDPs of Cromwell visitor activities second scenario
- GDPs3: The GDPs of Cromwell visitor activities third scenario
- GDPs2: Increased portion of GDPs2 (compared with GDPs1) influenced by walking instead golfing
- GDPs3: Increased portion of GDPs3 (compared with GDPs2) influenced by walking instead golfing and curling.

6.2.14. Comparison between the CFs of Naseby and Cromwell

6.2.14.1. Food

Figure 6.60 compares the CFs of food consumed in Naseby and Cromwell by their visitors. In this figure the quantities of food consumed in Naseby (30,936kg) in both Ideal (Q) and present (Q1) models are used as the 100% benchmark of food to compare the Ideal and present model of Cromwell with Naseby (see Figure 6.60).

In Figure 6.60, the present ecological footprint of food in Naseby (160.9gha) shown in the figure as EF-Na is used as the 100% benchmark for comparison between the present EFs of food in Naseby and Cromwell. In addition in Figure 6.60 the Ideal EFs of Cromwell and Naseby are compared with EF-Na as the 100% benchmark.

In Figure 6.60, the total GDP of Naseby (NZ\$309,360) is used as the 100% benchmark for comparison of the economic footprints of food in Naseby and Cromwell. In 2011, in Naseby 30,936kg (100%) and in Cromwell 17,662kg (57.09% compared with Naseby) of food was consumed by visitors. Figure 6.60 indicates that 11.8% (3,650kg) of food in Naseby and 1.4% (435kg) of the total 17,662kg (57.09% compared with Q1) in Cromwell were home prepared food.

Figure 6.60 demonstrates that the total EF of food consumed by Cromwell visitors (94.71gha) is 58.86% of the EF of food consumed by Naseby visitors (160.9gha as 100%). On the other hand the EF of food consumed by Cromwell visitors (94.71gha) is 66.19gha (160.9 – 94.71gha) smaller than the EF of Naseby food (160.9gha).

Furthermore as shown in Figure 6.60 the ideal EF of 30,936kg food consumed by Naseby visitors (30.61 gha) is 9.7gha (30.61– 20.91 gha) bigger than the ideal EF of 17,662 kg food consumed by Cromwell visitors (20.91 gha). In Figure 6.60, the overshoot portion of the EF of food in Naseby is 160.9gha (EF of Naseby) – 30.61 gha (Ideal EF of Naseby) = 130.29gha. In addition, the overshoot portion of the consumed food in Cromwell is 73.8gha (94.71 – 20.91gha). Consequently, the overshoot portion of the EF of food consumed in Naseby is 56.49 gha (130.29 – 73.8gha) bigger than the overshoot portion of the EF of food consumed in Cromwell.

The total GDP of Naseby related to consumed food (NZ\$309,360) as shown in Figure 6.60 is 42.91% (309,360 – 176,620 = NZ\$132,740) more than total GDP of Cromwell's visitor food. Furthermore the GDPs of the visitor food in Naseby (16.6% of its GDP- See Figure 6.60) is NZ\$20,900 (51,386 – 30,486) more than the GDPs of the food consumed in Cromwell.

As a conclusion for this section, it can be determined that if in Naseby the overshoot portion of its EF related to food is to be changed to its ideal EF through using a portion of its GDP, it has more GDPs than Cromwell. In addition, since Naseby takes the op-

portunity for those engaged in OCRT accommodation services to produce 10.4% (3,215kg) more home prepared food as a part of their cultural products, it can be said the CF of Naseby related to food is bigger than the CF of food in Cromwell. Likewise as shown in Tables 6.12 and 6.78, in both Naseby and Cromwell case studies, producing home prepared food that in this thesis is considered as a cultural indicator, contributes to reducing the EF of consumed food by 0.0017gha/kg. This means producing home prepared food is not only culturally appropriate but is also more environmentally sustainable than providing conventional food.

As explored in both case studies consuming home prepared food contributes to reducing the EF of food, consequently it contributes to increasing the sustainable portion of GDP. This means producing home prepared food is also more economically viable than providing conventional foods.

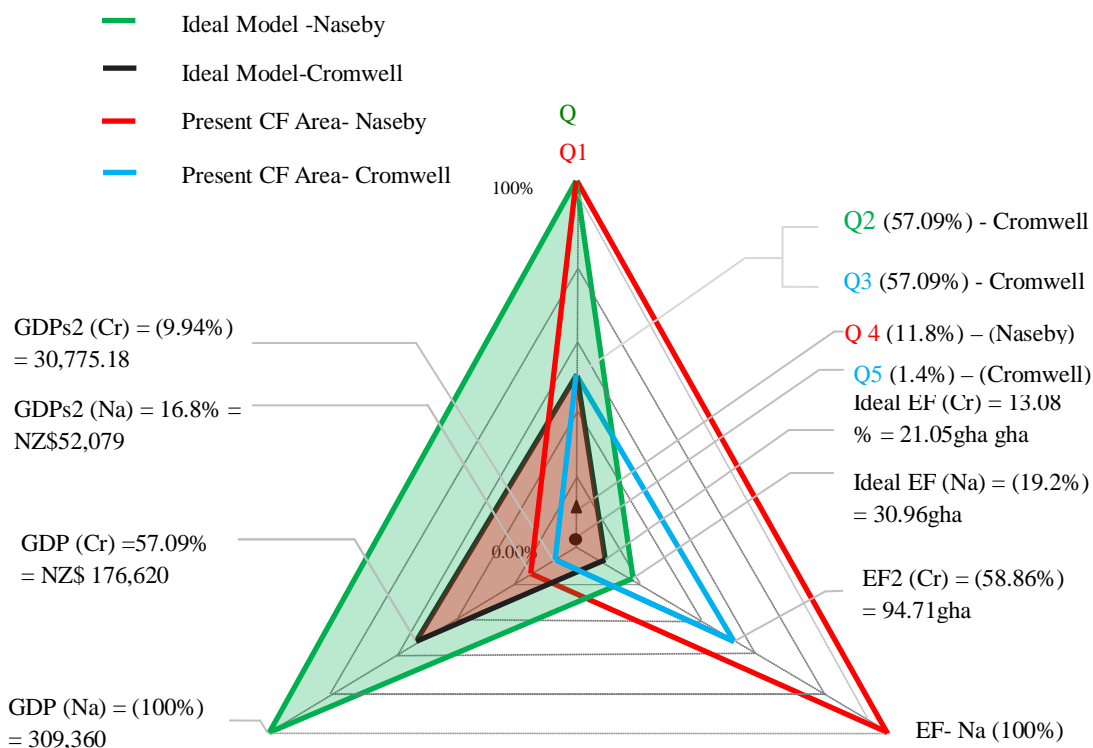


Figure 6.60: The CF of Naseby and Cromwell related to Food

- Q: 100% (30,936kg) food in Naseby - Ideal model
- Q1: 100% (30,936kg) food in Naseby including 98.2% (27,286 kg) conventional food + 11.8% (3650kg) home prepared (organic) food (used as benchmark)
- Q2: 100% (17,662kg) food in Cromwell - Ideal model that is equal to 57.9% of Q (30,936kg)
- Q3: 100% (17,662kg) food in Cromwell that is equal to 57.9% of Q1 (30,936kg) including 1.4% (435kg) home prepared food and 56.5% (17,227kg) conventional food
- Q4: 11.8% (3,650kg) home prepared food in Naseby
- Q5: 1.4% (435kg) home prepared food in Cromwell (compared with Q1)
- GDP (Na): 100% of GDP related to food in Naseby (Used as benchmark)

- GDP (Cr): 100% of GDP related to food in Cromwell that is equal to 57.09% of GDP (Na)
- GDPs2 (Na): GDPs Naseby related to food that is equal with 16.8% (NZ\$52,079) of GDP(Na)
- GDPs2 (Cr): GDPs of Cromwell related to food that is equal to 9.94% (NZ\$30,775.18) of GDP (Na)
- EF-Na: Present EF of Naseby related to food (160.9gha) that is used as 100% EF benchmark
- EF2 (Cr): 100% (94.71gha) EF of consumed food in Cromwell that is equal to 58.86% of E-Na (160.9gha)
- Ideal EF (Na): Ideal EF of consumed food in Naseby that is equal to 19.2% (30.96gha) of EF-Na
- Ideal EF (Cr): Ideal EF of consumed food in Cromwell that is equal to 13.08% (30.96gha) of EF-Na

6.2.14.2. Accommodation Services

Figure 6.61 compares the CFs of accommodation services used in Naseby and Cromwell in terms of the quantities, qualities, EFs and economic impacts of each. In Figure 6.61 100% (25,178 m²) of the area of Cromwell's accommodation services is used as a benchmark to compare the areas of Naseby and Cromwell accommodation services with each other.

Figure 6.61 shows that total area of Cromwell accommodation services is 25,178 m² shown in the figure as Q1. In addition in Figure 6.61, Q is the total area of Cromwell accommodation services (25,178 m²) in its Ideal model that quantitatively is equal to 100% of Q1.

As illustrated in Figure 6.61, the total area of Naseby's accommodation services in both its ideal model (Q2) and present (Q3) is 8,144 m² and this is 32.3% of the total area of Cromwell accommodation services (Q1= 25,178 m²). Figure 6.61 shows that of the 8,144 m² of Naseby accommodation, 2,592 m² (Q 4) is refurbished (RB) buildings, and this is equal to 10.33% of Q1 (the total area of Cromwell accommodation). As discussed in section.6.2.13.2, all Cromwell accommodation buildings are new (NB).

Figure 6.61 determines that 0.2% (57.2 m²) of the total (25,178 m²) area of Cromwell accommodation services (Q6) is open air spaces (V/B) and 100.1m² (0.4% of Q1) V/B are used as part of Naseby's accommodation area. In comparison with Cromwell accommodation, Naseby accommodation services contain 42.9 m² (100.1 – 57.2 m²) more open air spaces (V/B).

In Figure 6.61, 100% of the present EF of Cromwell accommodation services (8.046 gha) is used as a benchmark for comparisons between the EFs of the two case studies. This benchmark is shown as EF (Cr) in Figure 6.61. The figure shows that the total EF of 8,144 m² of Naseby accommodation services (7.012 gha) is equal to 87.1% of the

total EF (8.046 gha) of the 25,178 m² that make up Cromwell's accommodation buildings.

As shown in Figure 6.61, Ideal-EF (Cr) (the ideal EF of Cromwell accommodation services) is 22.24% (1.79gha) of its present EF (8.046gha). On the other hand the overshoot portion of EF (Cr) is 6.25 gha (8.046 – 1.79gha). Figure 6.61 indicates that the Ideal EF of Naseby accommodation services (1.34gha) is 16.65% of EF (Cr). Consequently, the Ideal EF (Na) is 5.75% (22.24% – 16.25%) smaller than Ideal EF (Cr). Indeed, Ideal EF (Cr) is (1.79 gha – 1.34gha) 0.45gha bigger than ideal EF (Na) (Figure 6.61).

Since the GDP of Naseby related to its accommodation services (NZ\$1,118,033) is more than the GDP of the Cromwell accommodation (NZ\$ 638,312.42), as shown in Figure 6.61, this study uses 100% of the GDP of Naseby (NZ\$1,118,033) as a benchmark to make a comparison between the economic footprints of accommodation services in the two case studies. As shown in Figure 6.61, the total GDP of Cromwell related to accommodation services (NZ\$638,312.42) that is shown in the figure as GDP (Cr) is 57.1% of GDP (Na). In fact, GDP (Na) is (NZ\$1,118,033 – NZ\$638,312.42) NZ\$479,720 more than GDP (Cr). Using GDP (Na) as an economic benchmark, the GDPs of Naseby accommodation services (NZ\$1,106,806) is 98.99% of (NZ\$1,118,033) GDP (Na), and the GDPs of Cromwell accommodation services (NZ\$625,893) is 55.98% of this benchmark (NZ\$1,118,033). On the other hand, the difference between GDPs (Na) and GDPs (Cr) is equivalent to 98.99% of GDP (Na) – 55.98% of GDP (Na) = 43.01% of (NZ\$1,118,033) GDP (Na) = NZ\$480,913. Likewise, the GDPs of Naseby accommodation services (NZ\$1,106,806) shown as GDPs (Na) is NZ\$480,913 (NZ\$1,106,806 – NZ\$625,893) more than the GDPs of Cromwell accommodation services.

Figure 6.61 gives the result that Naseby accommodation services use less area, have a smaller EF and a larger economic footprint than Cromwell accommodation services. In comparison with Cromwell, Naseby's accommodation buildings use more open air spaces (V/B) and have conserved more old buildings than Cromwell. As a result, Naseby accommodation services as shown in Figure 6.61 have a larger CF area than Cromwell accommodation. Likewise, the CF of the OCRT in Naseby in terms of the accommodation services is larger than its equivalent in Cromwell.

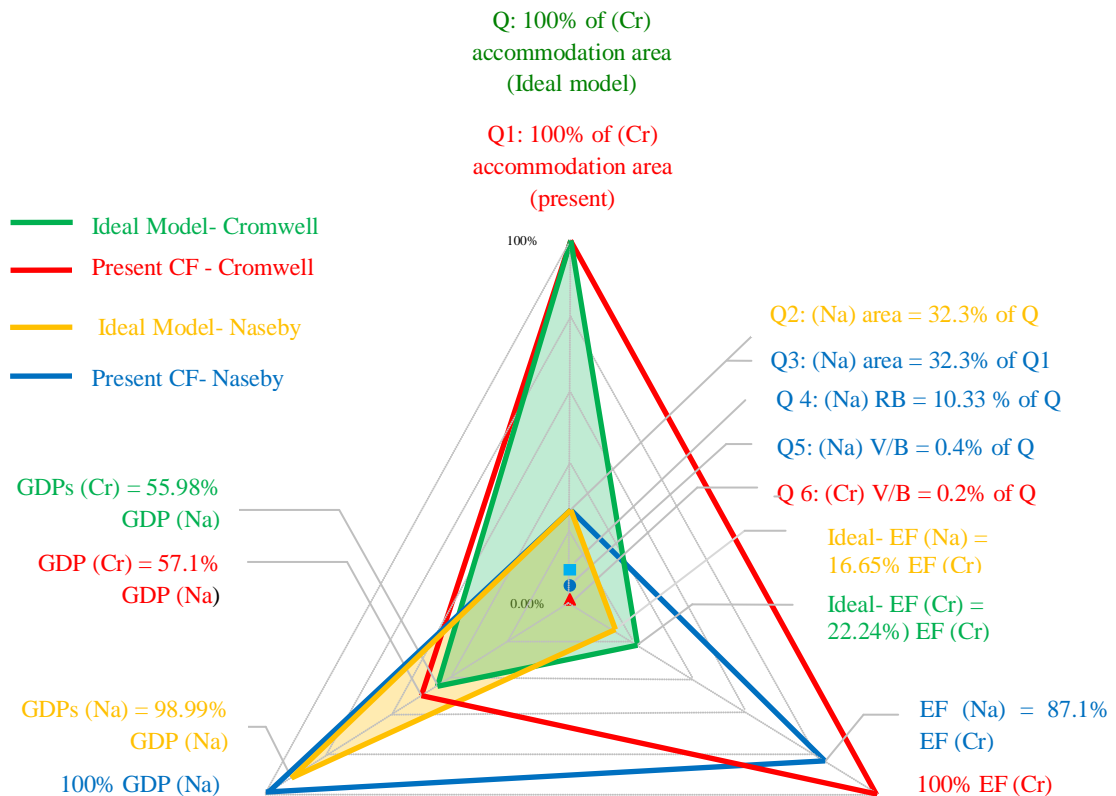


Figure 6.61: The CFs of Naseby and Cromwell related to accommodation services

- Cr: Cromwell
- Na: Naseby
- Q: 100% (25,178m²) of the area of Cromwell accommodation services in ideal model
- Q1: 100% (25,178m²) of the area of Cromwell accommodation services (present) used as benchmark
- Q2: 100% (8,144m²) of the area of Naseby accommodation services in ideal model that is equal to 32.3% of Q1 (benchmark)
- Q3: 100% (8,144m²) of the area of Naseby accommodation services (present) that is equal to 32.3% of Q1 (benchmark)
- Q 4: 31.8% (2,592m²) of Naseby buildings (RB) that is equal to 10.33% of Q1 (benchmark)
- Q5: 6.1% (100.1m²) of Naseby buildings used as V/B that is equal to 0.4% of Q1 (benchmark)
- Q6: 0.2% (57.2m²) of Cromwell accommodation services (Q1 = 25,178m²) used as V/B
- EF (Cr): 100% (8.046gha) of the present EF of Cromwell accommodation services used as benchmark
- E (Na): 100% present EF of Naseby accommodation services (7.012gha) that is equal to 87.1% of EF (Cr)
- Ideal- EF (Cr): The Ideal EF of Cromwell accommodation services (1.79gha) that is equal to 22.24% of the EF (Cr)
- Ideal EF (Na): The Ideal EF of Naseby accommodation services (1.34gha) that is equal to 16.65% of the EF (Cr)
- GDP (Na): 100% of Naseby GDP related to accommodation services (NZ\$1,118,033) that is used as benchmark
- GDPs (Na): GDPs of Naseby accommodation services (NZ\$1,106,806) that is equal to 98.99% of GDP (Na)
- GDP (Cr): 100% of the Cromwell GDP (NZ\$638,312) related to accommodation services that is equal to 57.1% of GDP (Na)
- GDPs (Cr): 100% of GDPs of Cromwell (NZ\$ 625,893.86) that is equal to 55.98% of GDP (Na)

6.2.14.3. Visitor Activities

Figure 6.62 compares the CF areas of Naseby and Cromwell related to their visitor activities. In Figure 6.62, Q1 represents 100% of total Naseby visitor activities (13,088 – see Table 6.53) and this is used as a benchmark and compared with Cromwell visitor activities. As shown in Figure 6.62, the total number of Cromwell visitor activities (7,922 – see Table 6.115) is 60.53% of Q1 (13,088 visitor activities). As shown in Figure 6.62, in both case studies the number of visitors activities at present and in the ideal model are equal ($Q1 = Q$ and $Q2 = Q3$).

In Figure 6.62, 100% of the EF and 100% of the GDP of Naseby are used as respective benchmarks for comparing both case studies with each other. Figure 6.62 illustrates that 100% of the EF of Cromwell related to its visitor activities (1.55gha – see Table 6.115) is equal to 51.3 % of the total EF of Naseby visitor activities (3.02 gha- see Table 6.53). As shown in Figure 6.62, the Ideal EFs of Naseby and Cromwell related to their visitor activities are equal to 15.6 % (0.47gha) and 11.6 % (0.38 gha) of EF (Na) respectively.

As demonstrated in Figure 6.62, the GDP of Cromwell related to its visitor activities (NZ\$450,603 – see Table 6.125) is 60.33% of (NZ\$744,446 – see Table 6.64) GDP (Na). In addition as shown in Figure 6.62, GDPs (Na) and GDPs (Cr) are equal to 99.33% (NZ\$739,498 – see Table 6.65) and 60.2 % (NZ\$448,296) of GDP (Na) respectively.

Figure 6.62 shows that the visitor numbers, EF, GDP and GDPs related to visitor activities in Naseby are more than in Cromwell. If the EFs of Naseby and Cromwell related to visitors activities are to be changed to their ideal EF through using part of their GDP to generate their overshoot portion of energy used in a sustainable way, then the visitor activities in both case studies can be considered to be environmentally sustainable activities.

However it should be remembered that in both case studies golfing represents the biggest EF/ visitor (0.003 gha). Although at present just few people choose golfing as one of their outdoor activities, its total EF is one of the four top EFs. This indicates that more development of golfing as a social activity can exert negative environmental impacts on the host destinations and it needs to be ignored in future policy for sustainable development of OCRT.

As discussed above, curling at Naseby is considered one of the main social-cultural activities that has been developed at the regional, national and international scales in this town, and that attracts many OCRT visitors to it. This makes an opportunity for local and indigenous people who are engaged with the OCRT to present other social-cultural products to visitors that in turn can contribute to conservation of their cultural heritage. However, reducing the EF of indoor curling can be achieved, for example by using more seasonal outdoor curling and spending a part of GDP to generate curling’s overshoot portion of energy use in a sustainable way.

In this chapter Cromwell is introduced as one the main destinations offered by the OCRT to its visitors. On the other hand like curling in Naseby, visiting old Cromwell town could be considered as an activity with local potential that could be developed at regional, national and international scales. Like Naseby, through reducing the EF of visitor activities at Cromwell it can become a more environmentally friendly host for its visitors with a rich social cultural heritage and sustainable economic gross domestic product.

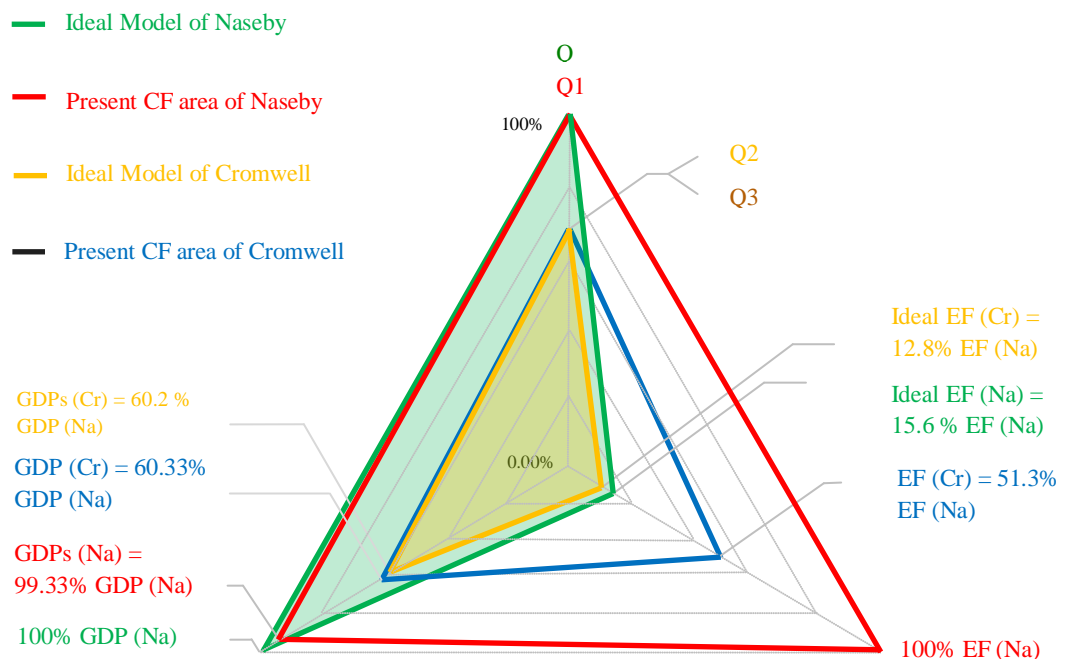


Figure 6.47: The CFs of Naseby and Cromwell related to visitor activities

- Q: 100% Naseby visitor activities (Ideal Model)
- Q1: 100% Naseby visitor activities (present) used as benchmark
- Q2: 100% Cromwell visitor activities (Ideal model) that is equal to 60.53% of Q1 (benchmark)
- Q3: 100% Cromwell visitor activities (present) that is equal to 60.53% of Q1 (benchmark)
- EF (Na): 100% of the EF of Naseby visitor activities used as benchmark
- EF (Cr): 100% of the EF of Cromwell visitor’s activities that is equal to 53.62% of EF (Na)

- Ideal EF (Na): Ideal EF of Naseby visitor activities that is equal to 19.84% of EF (Na)
- Ideal EF (Cr): Ideal EF of Cromwell visitor activities that is equal to 11.8% of EF (Na)
- GDP (Na): 100% of the GDP of Naseby related to its visitor activities used as benchmark
- GDP (Cr): 100% of the GDP of Cromwell related to its visitor activities that is equal to 60.33% of GDP (Na)
- GDPs (Na): GDPs of Naseby related to its visitor activities that is equal to 99.88% of GDP (Na)
- GDPs (Cr): 100% of the GDPs of Cromwell related to its visitor activities that is equal to 59.95% of GDP (Na)

Chapter 6: Summary

Naseby and Cromwell form two case studies with different environmental, cultural and economic characteristics (see section 3.3.2). Using these case studies allows the thesis to determine how the ecological, cultural and economic influences of ecotourism and its architecture on given host destinations can differ from one destination to another. Also in this chapter the main reasons for these differences are clarified. For example as (see Figure 6.47) the EF of visitor activities at Cromwell is 51.3% of the EF of visitor activities at Naseby. One of the main reasons for this difference are the curling clubs at Naseby (in particular indoor curling) accessed by 4,350 visitors in 2011.

As complementary answers to the research questions answers in Chapter 5, comparison between the different cultural footprints of the OCRT in these two case studies indicates that the environmental, social and economic influences of OCRT have different causes. Therefore sustainable development of the OCRT requires different strategies to reduce the impacts on its various destinations. On the other hand the framework and model demonstrate that even though achieving sustainability through ecotourism and its products has global goals, these rely on local and regional strategies for sustainable development. For instance the main environmental outcomes for the sustainable development of ecotourism is conservation of environmental resources, but, in the case of Naseby reducing the EF of indoor curling and in Cromwell reducing the EF of other tourism activities are two different priorities needed to achieve the environmental goal of sustainable development.

In response to questions 3.3.1.2 and 3.3.1.2 it can be stated that a strategy for the sustainable development of ecotourism and its architecture should determine the main environmental, cultural, and economic outcomes for the sustainable development of ecotourism and its architecture. Likewise a strategy should indicate the priorities that contribute

to achieving these outcomes. But, as shown in this chapter, at the site scale, these priorities change from one destination to another. This means all such priorities should be proposed in relation to the environmental, social and economic characteristics of the destinations. For instance in the case of Cromwell development of visiting historical sites and in Naseby development of outdoor curling can be considered as priorities for the sustainable development of the OCRT in these destinations.

Chapter 7: Conclusion

This thesis contributes to knowledge by setting the environmental, cultural and economic characteristics of ecotourism and its related architecture into a holistic model to explore the linkage between these profiles and their sustainability. To achieve this goal the thesis develops a quantitative methodology that comprises the comprehensive framework for the sustainable development of ecotourism and its architecture. This holistic cultural footprint model (CF-model) summarises a comprehensive framework proposed for sustainable development of ecotourism and its products including the architecture used as accommodation services. The CF-model contains an area that is introduced as the cultural footprint area and which is determined by the quantity of the social-cultural products and activities offered by the host destination of ecotourism and consumed/conducted by eco-tourists at one apex, and the ecological and economic footprints of these social-cultural behaviours on the two other apexes.

As sustainability is a multi-dimensional phenomenon that covers all human activities and products, this thesis uses its principles and strategies to determine a sustainable living area for those engaged in ecotourism development. Then the present cultural footprint of ecotourism, its products and activities can be quantitatively compared with the proposed sustainable living area. This quantitative comparison between the cultural footprints of ecotourism and its products and activities can show how far ecotourism is environmentally, culturally and economically from the sustainable model and what could be done to change the present cultural footprint to sustainable living circumstances.

Since environmental conservation is considered as the main environmental outcome for sustainable development of ecotourism and its related products and activities then their ecological impacts must be at a point of ecologically sustainable life. This study uses the ecological footprint (EF) of products and activities related to ecotourism as the main ecological indicator for evaluation of ecotourism and architecture as being sustainable. Comparison between the present EFs of ecotourism and its architecture with the EF of sustainable life related to these categories indicate how far is its environmental characteristic from the sustainable EF.

Awareness of the members of a society about their cultural capitals and heritage are introduced as one of the main anticipated cultural outcomes for sustainable development of ecotourism. The main productive activity that contributes to achieving the mentioned outcomes is conservation of the cultural heritage in the host society. In addition making this opportunity for local and endogenous participants to present their cultural capitals and products is viewed as a social-economic strategy for culturally sustainable development of ecotourism. This thesis uses the quantity of the cultural heritage that is preserved and cultural products that are produced through ecotourism as the cultural indicators to be used as tools to evaluate it and its products (including architecture) as being culturally sustainable.

This thesis uses a social- ecological lens to view the ecological and social impacts of economic development on the host society of ecotourism. Since the use of the current economic indicators such as GDP and GNP ignores the cost of environmental decline caused through the development process, for the first time, this study introduces GDPs (sustainable portion of GDP) as a social- economic indicator that is environmentally sensitive in relation to the development of ecotourism and its environmental impacts. The difference between the GDPs and the total GDP of ecotourism indicates the cost that must be spent to change the present EF of an ecotourism project to its sustainable EF.

The GDPs is not just a conventional economic indicator. As producing local products and development of local activities are considered as cultural indicators for sustainable development, the GDPs that determines the gross domestic products created through an activity as ecotourism also can be viewed as a social indicator. Since the cost of environmental conservation is subtracted from the total GDP to create GDPs, it can be introduced as an economic indicator that is environmentally sensitive.

In this thesis, the three cultural, environmental and economic indicators determine the three apexes of the cultural footprint area of ecotourism, its products and activities in the CF-model. Indeed the CF can be introduced as a holistic and multi dimensional indicator that contains all other ecological, cultural and economic indicators. For the first time this thesis proposes the CF model in which ecological, socio-cultural and economic aspects of a phenomenon such as ecotourism are linked together. Using the CF model can contribute to its users being able to measure and understand how their behaviours change their surrounding environment and their economic system. Likewise, using the

CF-model can contribute to making decisions about future development. It can indicate which parts of the current social-cultural behaviours should be developed, justified or must be completely ignored in strategies for future sustainable development.

The above-mentioned comprehensive framework that is summarised as the CF-model is tested through using three case studies of the Otago Central Rail Trail (OCRT), Naseby and Cromwell located along the rail trail.

This thesis investigates the cultural, environmental and economic impacts of the OCRT at the regional scale on its host destinations. The thesis finds that many historical sites and buildings have been refurbished through development of this project. This using of historical sites and buildings as OCRT attractions contributes to awareness of the engaged communities and components about their cultural identity. In addition the communities and their components are engaged in conservation of their cultural heritage through development of OCRT as an ecotourism project. On the other hand development of OCRT changes the attitude of people engaged in this project to their cultural heritage.

In terms of architecture used as accommodation services in the OCRT, using 78 refurbished buildings as accommodation services can be considered as one of the positive influences of OCRT on its host destination that contributes to preservation of their cultural identity.

Furthermore, the OCRT make the opportunity for local people to present their cultural products such as food, artefacts, crafts, activities and historic architecture to their visitors. The OCRT should not be considered as a merely recreational project, but also is an educational project that contributes to its visitors being able to know more about the cultural and environmental heritage and capitals of their hosts.

This thesis indicates that about 78.2% of the total EF of OCRT (1,617gha) is its current overshoot portion of the EF. As shown in Chapter 5 about 71.1 % of the total EF is caused by transportation. Moreover, this 71.1% of the total EF of OCRT is made up of 38.1% which is the EF of international transportation and 33.8% which is the EF of domestic transportation. It should be remembered at the same time that international visitors comprise just 22 % of the total numbers of OCRT visitors, although their transport forms 38.1% of the OCRT's total EF.

Through the use of the GDPs as an economic indicator it has been determined that because of the high overshoot portion of the EF of OCRT, 43.6% of its total GDP must be spent to change its present EF to the sustainable living EF with zero overshoot portion of ecological footprint.

This thesis determines that producing local products instead of using conventional products contributes to reducing the total EF of OCRT. As investigated in Chapter 5, in 2011, producing locally 17% of the total 65165.05 kg of food consumed by OCRT visitors, can reduce by 1.5% (23.2gha) its total EF (1,617 gha). Looked at in another way,, producing 1kg of home cooked food instead of conventional food can reduce the total EF of OCRT by 143 m². In addition, as determined in Chapter 5 producing home cooked food (as a cultural product) contributes to increasing income by NZ\$ 3.80 / kg of home cooked food. This thesis has made it possible to demonstrate clearly that using local products in ecotourism development not only is culturally appropriate, but also is environmentally friendly and economically viable.

In 2011 the OCRT visitors were involved with 18 types of activities that are categorised into the two categories of indoor (curling at Naseby) and outdoor activities. The curling at Naseby can be viewed as one of the important attractions of OCRT that attracts its visitors at the regional, National and international scales. This activity is considered as one of the distinctive potentials of OCRT for development of tourism. However its EF is one of the three top EFs of OCRT activities. The EF of indoor curling at Naseby can be reduced through making it a seasonal activity that is conducted during winter. Since the curling at Naseby attracts 4,350 of 11,788 OCRT visitors, this would make an opportunity for other OCRT components to develop their other cultural products.

If the EF of curling will be changed to the sustainable EF related to this activity through spending a portion of OCRT GDP to generate its overshoot portion of energy use, curling at Naseby can be considered as one of the culturally appropriate activities.

Most of the outdoor activities such as sightseeing, visiting historic sites and buildings, wineries, art galleries offered by OCRT and conducted by its visitors make the opportunity for its visitors to educate themselves about the environmental and cultural heritage of their host destination. Also the host people have the opportunity to present their cultural products to their visitors as a cultural economic activity. As demonstrated in Chapter 5 the total EF of OCRT activities covers 0.4 % (6.57 gha) of the total EF of OCRT

(1,617gha). In comparison with the EF of other categories including transportation (72.2%), food (24.8%) and accommodation services (2.6%) this is a small area of EF. However in comparison with other categories of activities, golfing has the highest EF/visitor (0.003 gha) and the smallest EF (0.00006 gha /visitors) belongs to activities such as walking , fruit picking and visiting heritage (e.g. Old Cromwell town).

This thesis determines that if an OCRT visitor changes his or her preferred activity from golfing to outdoor activities with small EF (e.g. walking) it can reduce his/her EF related to the activities by 0.00294 gha /visitor (29 m²/ visitor). As shown in Chapter 5 just a few visitors (153) of total 11,788 OCRT visitors choose golfing as one of their activities but the EF of them related to golfing is one of the three top EFs related to OCRT activities. The number of visitors that play golf indicates that golfing is not a significant cultural activity because just a few people are interested to do that. Likewise in comparison with other activities its EF/visitor is the highest EF area. Consequently its GDPs /visitor is the lowest amount of GDPs/ visitor. This thesis suggested that the development of activities such as golf with high EF and low GDPs and small number of participants should be completely ignored in the future strategy for development of the OCRT.

Using renovated historic buildings for 78 of 226 OCRT accommodation buildings shows the changing of the attitudes of OCRT components to their cultural heritage caused by OCRT development. This indicates that the architecture used in OCRT is culturally sensitive and contributes to the visitors being able to know more about the cultural background of their host destination. In addition as determined in this study using refurbished buildings as accommodation services not only is culturally sustainable but also can decrease the total EF of OCRT and increase its GDPs. The thesis demonstrates that using refurbished buildings to provide 21,378 m² of the total of OCRT accommodation services (80,356m²) can reduce by 0.8 gha its total EF. However it should be remembered that both types of refurbished (RB) and new (NB) buildings used as accommodation services use electricity as the main source of energy.

Using renewable sources of energy can be considered as one necessity that should be applied in OCRT accommodation services to make this sector more environmentally sustainable.

The thesis shows that using open air spaces as parts of the buildings is advertised by most of the accommodation owners as a positive potential of their services. This means using open air spaces can be viewed as one of the appropriate cultural behaviours in OCRT.

Furthermore as has been indicated in Chapter 5, using 378 m² of the total 80,356 m² accommodation area as veranda and balcony contributes to reducing 0.8 gha of the total EF of OCRT accommodation services. This means using 1 m² of veranda/ balcony can reduce the EF of accommodation services by 21.1m². In turn it can contribute to development of the GDPs. Consequently using verandas and balconies in OCRT accommodation services is a culturally appropriate policy for development of architecture which also is an environmentally friendly and economically sustainable strategy.

Using the comprehensive framework and its conceptualised model (CF-model) to investigate the cultural footprint of OCRT on Naseby and Cromwell indicates that using local products has the same ecological and economic outcomes in both case studies as in the OCRT as a whole.

This thesis determines that in Naseby local products (home prepared food) are used more than in Cromwell. In addition the GDPs of Naseby related to the local products is more than for Cromwell. If the overshoot portions of the EF of both Naseby and Cromwell will be changed to the Ideal sustainable EF, as Naseby has more economic outcome and more quantity of the local products than Cromwell, its cultural footprint is more positive than Cromwell in terms of the local products.

Since the accommodation services in Naseby contain refurbished buildings, use less indoor areas, comprise more area of veranda and balcony, have more GDPs and smaller EF than Cromwell's accommodation services, Naseby also has more sustainable cultural footprint than Cromwell in terms of accommodation services.

Chapter 6 shows that Naseby activities have more potential than Cromwell to attract OCRT visitors. Also Naseby has more GDPs than Cromwell, and the same EF/visitor activity. If the overshoot portions of the EFs of both case studies will be changed to the Ideal EF of sustainable activities, then Naseby's activities will have more positive CF than Cromwell visitors' activities.

This thesis concludes that the proposed comprehensive framework and the CF-model can be used as an holistic tool to make the link between ecological, cultural and economic characteristics of ecotourism and its related architecture as being sustainable.

This thesis results in the finding that the main characteristics of an architecture that will contribute to sustainable development through ecotourism can be conceptualised as one characteristic of its cultural footprint. **As the main finding of the thesis, in response to the key question it is concluded that the main characteristic of an architecture that will contribute to sustainable development through ecotourism is having a sustainable cultural footprint on the host destination.**

The proposed methodology and methodological framework have advantages that can be conceptualised as:

- Using a holistic approach to the development of ecotourism and its architecture through sustainability and its principles.
- Using an existing information system for research that contributes to testing the system as being appropriate for the sustainable development of ecotourism.

Conversely, the main shortcoming of the methodology and the methodological framework is the lack of an efficient information system for creation and management of the necessary data.

Arising from the above limitation, the accuracy of the results is another potential shortcoming of the thesis. However, using a comparative method to evaluate ecotourism and architecture helps to ameliorate these limitations. Furthermore, the thesis shows the necessity of having an efficient information system as a fundamental for the sustainable development of ecotourism and its architecture.

Goals for future research in terms of the CF-model are using it to determine the different cultural footprints of ecotourism and its architecture at different times in the same place. This would contribute to clarifying how tourism and its architecture exert influence on a society through the evolution of other factors such as technology, facilities, materials, and social behaviours at different times in the same place. The results could be used in the sustainable restoration of a part of the cultural identity of a given society previously impacted by the unsustainable development of tourism and its architecture arising from modernism and capitalism.

Moreover using the CF-model could contribute to defining a new structure of urban spaces for use as host destinations for soft ecotourism, based on introducing social cultural boundaries for each category of urban component related to soft ecotourism. The CF boundaries could be used to determine the way in which the interactions between different urban spaces with each other and their surrounding environment can be assessed as being more or less sustainable.

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Appendix1: NZST 2015- forecasted activity need to do to achieve anticipated priorities (cited in Table 2.2).	
Priority No.	Action needs to do to achieve priorities
1	Invest in strengthening New Zealand’s global marketing campaign with more funding for Tourism New Zealand
	Develop marketing initiatives that focus on changing consumer attitudes and expectations in China and other new markets
	Coordinate the investment in overseas marketing (public and private) to improve the conversion of preference to travel to actual travel.
	Make sure that the unique elements of Maori culture are reflected in the way New Zealand’s brand is positioned internationally, and in national and regional product development
2	Monitor how and where international and domestic visitors make their bookings, so that we invest in the most effective distribution channels, and educate tourism operators about how to get the most out of those channels
	Make sure that tourism operators invest in the technology they need to best manage their bookings and inventory
	Make sure that quality Maori tourism products and services are better integrated throughout the full range of wholesale and retail distribution channels
3	Build on the common business and information systems in the i-SITE network to make sure that i-SITES across the country offer a consistent experience
	Carry out research into ways in which the I-Site network could be used to help improve visitor experiences. This would build on previous research into the information needs of I-Site users
4	Broaden Qualmark’s coverage by adding new categories into the existing range of gradings and endorsements, and increasing the uptake of Qualmark by tourism operators
	Make sure that Qualmark’s assessment systems are consistently applied, and are recognised and supported by the tourism sector
	Help domestic and international consumers get a better understanding of the Qualmark grading system, so that they feel more confident about selecting Qualmark-endorsed products, and they know what these services will deliver
5	Enhance the quality of the accuracy of the International Visitor Survey and Domestic Tourism Survey
	Integrate all the research about visitor satisfaction into one common platform or database
	Extend the Regional Visitor Monitor (RVM) into more regions, and expand the focus of both the RVM and the Domestic Tourism Survey to provide information about buying behaviour and what drives travel trends
6	Make sure that there is enough investment in the infrastructure needed to meet growing visitor demand. This includes roads, the availability of broadband, especially in more rural and remote areas, water supplies, managing waste water, public toilets, signage, and car parks
	Make sure that airport authorities and border control agencies have the information they need to plan for tourism growth so that they have the staff and resources they need to cope

	at peak times
	Investigate the case for developing national facilities such as a national convention centre and cruise–ship facilities
7	Establish a domestic tourism working group to develop a domestic tourism plan
	Encourage and support Regional Tourism Organisations to communicate with stakeholders the importance of regional campaigns in driving the domestic market and creating opportunities to increase domestic travel
8	Keep building business capability through the Maori Business Facilitation Service
	Increase the number of Maori tourism businesses involved in quality accreditation schemes such as Qualmark and Toi Iho
	Help tourism businesses to incorporate a Maori dimension into the products and services they provide
	Increase the range of Maori products and services being offered to the international and domestic markets
	Strengthen relationships between Regional Tourism Organisations and Maori Regional Tourism Organisations to maximise the development of a Maori tourism product that reinforces regional differentiation and meets visitor demand

Appendix2: NZST 2015- forecasted activity need to do to achieve the anticipated priorities (cited in Table 2. 3).	
Priority NO.	Action needs to do to achieve priorities
1	<p>Improve resource efficiencies, workforce management, and profitability opportunities for all businesses through more clustering, joint ventures, and other industry cooperation initiatives.</p> <p>Encourage the hotel industry, inbound tour operators, and airlines to work together on things such as pricing, seasonal campaigns, and the way products are packaged to increase occupancy rates and profitability.</p> <p>Streamline and improve the focus of existing business–assistance programmes to help operators increase their return on investment and develop quality products.</p> <p>Build management capability by identifying and developing staff to undertake effective management training programmes.</p> <p>Make sure that tourism operators and destinations get better access to broadband services when the New Zealand Digital Strategy is being implemented.</p>
2	<p>Target those markets that are likely to spend more than average.</p> <p>Develop existing products and services so that they increase the value of the visitor experience and encourage higher levels of spending.</p> <p>Provide better service delivery and interpretation, including on–site interpretation at visitor attractions.</p> <p>Ensure businesses have access to research and other market intelligence to assist them in their product development.</p>
3	<p>Implement the Tourism and Hospitality Workforce Strategy by:</p> <p>Making sure the tourism sector has a strong voice with labour, education and training policy makers.</p> <p>Identifying and promoting opportunities for the sector to increase its productivity.</p> <p>Get more benefits from education and training through an active partnership with the education and training sector. This should be underpinned by closer links between businesses, providers of training, and industry–training organisations. The industry also needs to coordinate its input to the Tertiary Education Commission reviews.</p> <p>Identify opportunities to make the best use of people, including:</p> <ul style="list-style-type: none"> • investing in technology that improves business efficiency and means that employees are engaged in the most productive activities. • developing visitor experiences that are less labour–intensive but do not compromise quality.

	Seek targeted immigration to fill critical skill gaps and provide workers during the peak period. This will require coordination within the industry, and cooperation with the Department of Labour.
	Develop ways for tourism businesses to monitor labour productivity and improve the contribution that their people make to the performance of their business.
4	Bid for, and secure, major international events, which will help reduce seasonality.
	Coordinate existing conference and incentive marketing activities to increase the performance in this market.
	Invest in marketing initiatives that target those domestic and international visitors who are more likely to travel in the shoulder and off-peak seasons.
	Identify and develop products that are likely to increase travel during the shoulder and off-peak seasons. Examples include Matariki and the Pacifica Festival. Products with all-weather options are another possibility.
5	Develop and fund an industry-government partnership model to advance sector research, including determining priority research and then directing, funding, and managing the delivery of this research.
	Establish quality measures for the Core Tourism Data Set and develop and implement ways of achieving the agreed quality standards.
	Make more sectoral and regional data available to the sector through: <ul style="list-style-type: none"> • further analysis of existing data sources • collecting additional data through industry partnerships.
	Establish a set of measures to track performance in the sector, including financial performance, managing seasonality, and increasing visitor satisfaction.

Appendix3: NZST 2015- forecasted activity need to do to achieve anticipated priorities (cited in Table 2.4).	
Priority NO.	Action needs to do to achieve priorities
1	Seek the completion of a national environmental management plan to clearly articulate priorities for all of New Zealand by December 2008.
	Understand and use the value of kaitiakitanga (guardianship) as the basis for the tourism sector's actions to enhance the environment.
	Participate in and influence global forums and agreements on environmental issues that affect New Zealand tourism, and implement their requirements.
	Both advocate for and actively support stronger environmental policies, standards and regulations throughout New Zealand.
	Develop indicators for the sector (at both a national and operator level) to measure, manage, and monitor environmental impacts, and use these to evaluate performance over time.
2	Understand the environmental aspirations of our current and future international visitors, and how they view New Zealand's environmental management.
	Use this information in marketing and to develop tourism products, targeting visitors who support New Zealand's environmental values and whose ethics, behaviour, and impacts align with those values.
	Help consumers to make informed product choices that align with their environmental values by using environmental ratings and labelling, and making consumers aware of environmental accreditation schemes.
3	Make sure that tourism vehicle, aircraft, and boat fleets are New Zealand's most fuel-efficient and produce the lowest emissions possible by, for example: <ul style="list-style-type: none"> • using transport fuels that contain the highest available proportion of bio-fuels, and encouraging visitors to do the same • buying vehicles for commercial and rental fleets that are the most fuel-efficient for their intended use, such as diesel or hybrid vehicles • buying Euro IV standard engines for diesel transport fleets, and Euro V standard engines once compatible fuel is introduced on 1 January 2009.
	Improve the fuel efficiency of operators and visitors by, for example: <ul style="list-style-type: none"> • adopting best-practice standards for fuel-efficient fleet management. This includes engine maintenance, tyre pressure, and reducing visible smoke emissions

	<ul style="list-style-type: none"> • recommending the most fuel-efficient transport to visitors to meet their travel needs • educating operators and visitors about driving to improve fuel efficiency.
	Work with Air New Zealand and other airlines to develop options that allow tourists to reduce and/or offset the carbon emissions they generate by flying to New Zealand.
	Support government initiatives to adopt and enforce emissions testing and minimum emissions standards for importing vehicles into New Zealand.
	Promote the use of public transport, rail, coaches, cycling, and walking as environmentally friendly modes of transport. Advocate for and support the development of the services and infrastructure needed to make these forms of transport possible.
4	Work with organisations such as the Energy Efficiency and Conservation Authority on initiatives to improve environmental management in tourism and to implement the goals of the New Zealand Energy Efficiency and Conservation Strategy.
	Make sure new buildings and retrofits use the highest possible energy-efficient building standards, and that eco-verified procurement criteria are used when buying products and appliances.
	Adopt energy-management practices and new technologies to reduce overall energy consumption. This includes using timers, thermostats, occupancy sensors, and renewable and local sources of energy wherever possible.
5	Tourism operators must regularly audit the amount of waste they produce, take steps to reduce, reuse, and recycle waste, and provide facilities that encourage visitors to do the same.
	Work with local government to develop appropriate facilities, standards, and planning for waste management. Examples include public recycling in all main centres, developing policies on freedom camping, and preparing regional waste strategies.
6	Encourage tourism operators to use the environmental elements in Qualmark to lift their environmental performance, and look at ways of increasing the uptake of these elements across the sector.
	Work with Qualmark or other service providers to build operator capability in delivering environmentally sustainable products and services.
7	Take an early interest in the development of national park management plans, conservation management strategies, reserve management plans, marine plans, and other related processes, to make sure that they are developed in a collaborative, proactive style and address the interests and needs of operators, visitors, and local communities.
	Make sure that all DOC ¹ visitor monitoring and evaluation is carried out in a consistent manner, and that the data is used to establish appropriate management objectives and shared with the relevant tourism agencies.
	Look at developing visitor services and facilities, such as walking and mountain biking tracks and interpretation centres, in places where they can provide social, cultural, economic, and conservation benefits.
	Investigate potential funding mechanisms for visitors to contribute towards adding value to the visitor experience and the provision of facilities and services on lands and waters managed for the benefit of the public.
	Manage issues at key sites where important values (environmental, social, or cultural) are perceived to be under pressure environmentally and/or socially.
8	Develop products that make it possible for visitors to reduce their environmental footprint and leave New Zealand 'better than they found it'. Possibilities include conservation projects that encourage visitor interaction, such as ecological restoration, pest eradication, or investment in renewable energy.
	Make sure all visitors and tourism operators have the opportunity to participate in verified carbon offsetting programmes for any remaining emissions.
	Develop national guidelines for running major events within New Zealand that incorporate environmental requirements into any government-funded events.
1. DOC: Department Of Conservation	

Appendix4: NZST 2015- forecasted activity need to do to achieve anticipated priorities (cited in Table5).	
Priority NO.	Action needs to do to achieve priorities
1	Engage with communities at a strategic level through increased engagement at the governance level — for example, through community boards and councils.
	Contribute to local government processes by providing coordinated comments and submissions on, for example: <ul style="list-style-type: none"> • district plans • long-term council community plans • annual business plans • regional tourism • destination-management or economic development strategies • Resource Management Act processes.
	Use the best available advice and information, such as Have Your Say, published by the Tourism Industry Association, to participate in local government processes.
	Work with local authorities to increase the value that tourism brings to their communities and to manage and mitigate any undesirable effects.
2	Refine and promote the tools and statistical resources that now exist to help local authorities to plan for, invest in, and manage tourism.
	Prepare tourism strategies or destination-management plans that establish what strategic directions, management, infrastructure, and product development are needed and what the community outcomes of tourism will be.
	Review 'Postcards From Home', the Local Government New Zealand Tourism Strategy.
	Take part in national decision-making on tourism issues, such as strategy development, policy, and funding.
	Keep strengthening the governance, management, and operations of Regional Tourism Organisations through wider uptake of the Roles and Guidelines for Tourism Organisations advice produced as a result of the New Zealand Tourism Strategy 2010.
	Provide certainty of funding to Regional Tourism Organisations and i-SITEs through a more proactive use of the range of funding tools currently available.
3	Make sure that high-quality research is available to local communities to inform decision-making by local government and the tourism sector, including information on the social, economic, environmental, and cultural benefits of tourism to communities.
	Research affordability issues for domestic tourism, including expectations, price sensitivities, and pricing mitigation options, to inform business positioning, product differentiation, and market segmentation decisions.
	Research the perceptions and experiences of crowding at times of peak capacity from a community perspective. This includes assessment of impacts on communities and visitor satisfaction, case studies, management options, and tools for local authorities to use. This should sit alongside work previously undertaken by DOC in relation to capacity issues on the conservation estate.
4	Strengthen existing events and set up new events and products that promote regional identity and differentiation.
	Build the capability of the i-SITE network to promote local culture, and build connections with the local tangata whenua and with the iconic landscape of each region.
	Communicate and promote the concept of manaakitanga and its importance in hosting both domestic and international visitors.
5	Assess core needs, and investigate and consider funding models to improve the standard and provision of appropriate infrastructure.

Appendix.5: OCRT-Accommodation Facilities, Area and the Used Materials (2011)									
1. RB= Restored and Historic 2. SC= Self-Contained 3. Bp= Backpacker 4. B&B= Bed and breakfast 5. N/A information not available									
NU	Location	Accommodation	Type	Quality	Facility		Products and activities	Area	Materials
					Common area	Bedrooms			
1	Middlemarch	Annandale	1×B&B	New	Writing area, guest living room, TV, a Victorian fireplace, a heat pump, log burner and HRV ventilation on cooler days.	All bedrooms with bathroom with shower and bath, tea and coffee making facilities, heaters, electric blankets and lighting.	Breakfast, homemade preserves and jams, OCRT, Middlemarch city, views of the Rock and Pillar Range, productive garden, reading materials.		Timber
2	Middlemarch	Blind Billy's Holiday Camp (3motel units)	3×Motel	New	Each of 3 units has full equipped kitchen, bathroom and toilet, tea and coffee making facilities.	All bedrooms with heating and lighting.	OCRT, Middlemarch city and its products and attractions, Sutton Salt Lake, a tour of the nearby Oceania Gold open-cast mine at Macraes, walks up the Rock & Pillar Range, landscape views, historical sites and buildings, bike hire, 18 cultural events listed in table 1, golf course, horse riding, fishing, curling at Naseby, gold mining.		Timber
3	Middlemarch	Blind Billy's Holiday Camp (2 studio units)	2×SC	New	Each of 3 units has full equipped kitchen, bathroom and toilet, tea and coffee making facilities.	All bedrooms with heating and lighting.			Timber
4	Middlemarch	Blind Billy's Holiday Camp (7 tourist cabins)	7×SC	New	Each cabin has bedding, tea and coffee making facilities.	Each cabin has heater and lighting.			Timber
5	Middlemarch	Blind Billy's Holiday Camp (3 backpacker cabins)	3×Bp	New	Using communal services in the camp including children's playground, free gas BBQ, free laundry facilities (staff use only), toilet block and	Each cabin has heater and lighting.			Timber

					shower facilities.				
6	Middlemarch	Blind Billy's Holiday Camp(On-site caravans)	1×Caravan/camping	New	Fully equipped rail carriage kitchen, sun deck dining, children's playground, free gas BBQ, free laundry facilities (staff use only), toilet block and shower facilities.	Caravans with [heating] and lighting.			-
7	Middlemarch	Blind Billy's Holiday Camp(Caravan, campervan points and tent site)			Fully equipped rail carriage kitchen, sun deck dining, children's playground, free gas BBQ, free laundry facilities (staff use only), toilet block and shower facilities.				Caravans with [heating] and lighting.
8	Middlemarch	Cottesbrook	2×SC-cottages	RB	Each of 3 bedrooms cottage has its own gas-heated, shower and toilet, full equipped kitchen, lounge, laundry facility, verandah and log burner. One cottage has a shared TV.	All bedrooms with lighting.	Continental breakfast, surrounding private farm, mature gardens, OCRT, Taieri river, walkway up to the nearby Rock and Pillar range and walk to Sutton Salt lake, wildlife watching, fishing, canoeing, swimming, golf course, farm tracks, local shuttle service.		Timber
9	Middlemarch	Gladbrook	1×B&B	RB	2 shared bathrooms, sitting room, dining room, verandah and open fire.	All 5 bedrooms have electric blankets, hairdryer and lighting.	Breakfast, OCRT, Middlemarch city, historic area, garden, walk up the Rock and Pillar range and the Sutton Salt lake, sheep mustering activity,		Timber

							vistas of Strath Taieri, reading materials, tennis, croquet.		
10	Middlemarch	Gladbrook (cottage)	1×SC-	RB	Both cottage and hut have bathroom comprising toilet and shower, equipped kitchen including fridge/freezer, separate freezer, stove and oven, tea and coffee supplied, toaster, TV, radio, laundry tub, washing machine, ironing equipment, BBQ and fireplace.	Each room has electric blankets (in cottage), hot water bottle (in hut), heater and lighting.	Food (free range eggs from owners' hens, bread and butter and milk), continental breakfast, OCRT, Middlemarch city, historic area, garden, walk up the Rock and Pillar range and the Sutton Salt lake, sheep mustering activity, vistas of Strath Taieri, books/library, small conferences, wedding and Christmas party.		Timber
11	Middlemarch	Gladbrook (hut)	1×SC-	RB					
12	Middlemarch	Jack's Stone Cottage	1×SC	New	Bathroom and toilet, fully equipped kitchen, lounge, TV, DVD player, laundry facilities, log burner, on cooler nights.	Both bedrooms with electric blankets and lighting.	Continental breakfast, OCRT, Middlemarch city, planted garden, fishing rods and golf clubs (left and right handed).		Schist stone
13	Middlemarch	Middlemarch B&B	1×B&B	New	Shared bath room, outdoor-indoor living, garden room, log burner, TV,	All 3 rooms have electric blankets, wireless internet, and lighting.	Home baking, continental breakfast, wine, OCRT, Middlemarch city, views of the Rock and Pillar Range, surrounding private garden (1.2 acre).		Timber, stone and concrete
14	Middlemarch	Pukenangi Country Retreat	1×SC	RB	Kitchen, parlour, fireplace.	Each room has bathroom, TV, hair dryer, under floor heating, wall heater, electric blankets, and heated towel rail.	Packaged foods, cooked or continental breakfast, wine and beer, OCRT, Middlemarch city, tour 6000 hectare Bare		Stone- timber

							Wood Station, watch farming demonstration appropriate to the season, visit Sutton Salt lake, local transport service along the OCRT way, booking services including shuttles, bike hire, accommodation, bag transfer, Taieri Gorge Railway.		
15	Middlemarch	Rose Cottage B&B	1×B&B	New	A shared bathroom with gas heated shower, outdoor seating, TV, BBQ facilities, a fridge with chilled rainwater, tea and coffee making facilities.	An individual bathroom with gas heated shower, a private verandah, hair dryer, heating, electric blankets, lighting.	Food and beverages, OCRT, Middlemarch city, Middlemarch museum, visit historical heritage, rural garden, books and magazine, in conjunction with Mt Ida adventure tour, tennis racquets and balls, petanque, golf clubs and mountain bikes, fishing, walking, , visiting wild life watching, landscape painting and photography, cafe culture, local transportation and bag transfers between accommodation places.		Timber
16	Middlemarch	Strathmore B&B	1×B&B	RB	A shared bathroom with under floor heating, BBQ, outdoor sitting, in ground	TV, coffee tea making facilities, heating and lighting.	Country style cooked breakfast, OCRT, Middlemarch city,		Stone

					swimming pool.		visit historical heritage, local transportation along the OCRT.		
17	Middlemarch	Strath Taieri Hotel	1×Hotel	RB	3 shared bathrooms, 2 showers, laundry, guest lounge, 2 bars with outdoor sitting ATM cash machine.	Each room has tea making facilities, heater and lighting.	Food and beverages, OCRT, Middlemarch city, historic sites, landscape views.		Schist stone
18	Middlemarch	The Farm Homestay	1×Homestay	RB	Guest lounge with fire place, shared bathroom, shower, disabled access, washing machine, dryer, spa pool, VCR, Sky TV, DVD player, internet.	2 bedrooms with lighting and [heating].	Breakfast, OCRT, Middlemarch city, farm sheep, cattle and horse, landscape views, historic sites and buildings, local transportation.		Stone
19	Middlemarch	The Lodge	1× B&B	RB	A shared bathroom (used by 2 bedrooms),fully equipped kitchen with micro-wave oven, dishwasher, toaster, coffee percolator, fridge/freezer, dining room, lounge, TV,DVD player, stereo, laundry facilities, 2 recreational area with gas BBQs.	2 bedrooms with ensuites (one with disabled access), heating, lighting.	Continental breakfast, OCRT, Middlemarch city, historic sites, landscape views, books and magazines.		Timber
20	Middlemarch	The Rocks luxury Accommodation / Longford Retreat	1×SC	RB	Shared bathroom, kitchen, sitting room, TV, veranda, outdoor sitting room, dining room.	All bedrooms have heating and lighting.	Food and beverages, continental breakfast, wine, OCRT, Middlemarch city, historic sites, Sutton Salt lake, Taieri Gorge Train, landscape views, 7000acre Fine Wool Merino Station, farm tour, fishing, walk up to the Rock		Timber

							and Pillar range, Smooth Cone hill, riding mountain bikes, photography.		
21	Middlemarch	The Rocks luxury Accommodation / Braeside Cottage	1×B&B	New	Shared bathroom, kitchen, fireplace, TV, self-catering setup.	All bedrooms have heating and lighting.	Food and beverages, continental breakfast, wine, OCRT, Middlemarch city, historic sites, Sutton Salt lake, Taieri Gorge Train, landscape views, 7000acre Fine Wool Merino Station, farm tour, fishing, walking up to the Rock and Pillar range, Smooth Cone hill, riding mountain bikes, photography.		Schist stone
22	Middlemarch	Trails End	2×SC	New	Kitchenette, ensuite bathroom, BBQ facilities, a lounge with TV, spa pool.	Each bedroom has TV, tea and coffee making, heater and lighting.	Food and beverages, OCRT, Middlemarch, city, historic heritage, fishing, Macraes goldmine tour, Sutton Salt lake, Taieri Gorge Train.		Timber
23	Ngapuna	Off The Trax	1×SC	RB	Bathroom and toilet, kitchen with gas cooking, microwave and fridge, outdoor sitting area, BBQ area, sitting room with TV, fire place, washing machine and dryer.	Bedrooms have heating and lighting.	Food and beverages, fresh vegetables, farm fresh eggs, OCRT, 20 hectares surrounding farm land, landscape views, wildlife watching, fishing, swimming, horse riding, local transportation, luggage transfer.		Stone

24	Ngapuna	Big Hut	1×Bp	RB	Small kitchen, dining table wash room, (all with solar powered lighting), tank water, outside toilet (no artificial heating in the hub) , tennis table.	No individual services, lighting through the use of solar system. Big hut can be subzero in winter.	OCRT, the Rock and Pillar conservation area, recreational activities- tramping, mountain biking, rock climbing, landscape photography, cross-country skiing.		Timber, corrugated iron
25	Macraes Flat	Stanley's Hotel	1×Hotel	RB	Shared bathroom and toilets, kitchen (used by hotel to prepare food for visitors), dining with fire place and TV.	All rooms have heating and lighting, one unit with own bathroom.	Fresh food, beverages, wine and beer, continental breakfast, OCRT, hotel's garden, visit Macraes Flat gold mining heritage tour, visit historic village, scenery, walking, photography, local transportation.		Schist stone
26	Hyde	Otago Central Hotel B&B & Hyde café (B&B)	1×B&B	RB	4 bedrooms with shared bathrooms and toilets, lounge room, TV, camping area with shared shower.	4 double rooms with ensuites,3 bedrooms with disabled access. 2 bedrooms have coffee and tea making facilities, all rooms with heating and lighting.	Food and refreshments OCRT, the historic Macraes Flat gold mining town, the old Golden Point mine in Deepdell Creek.	Timber	
27	Hyde	Otago Central Hotel B&B & Hyde café (camping)	1×Camping						
28	Hyde	Emerald Hills Country (guesthouse)	1×B&B	New	3 bedrooms with shared bathrooms and separate toilet, kitchen with oven, microwave, fridge freezer, living room, washing machine, BBQ and TV.	All rooms have heater, electric blanket, hairdryer and toiletries and lighting,	Food-wine and beer, continental breakfast, oven fresh baking, OCRT,4 acres private country garden, magazines, farm tours,		Stone and timber

29	Hyde	Emerald Hills Country (cottage)	1×B&B	New	Kitchens with oven, microwave, fridge freezer, living room, washing machine, BBQ and TV.	2 bedrooms with ensuite, 1 bedroom with private bathroom and toilet, all rooms have heater, electric blanket, hairdryer and toiletries and lighting.	Macraes Flat gold mining town, historic sites tour, landscape views, walking, horse riding,		
30	Hyde	Pine Grove	1×SC	RB	Kitchen with oven, microwave, fridge and freezer, claw foot bath, living room, log burner with wood supplied, BBQ, laundry with washing machine.	3 furnished bedrooms with heating and lighting.	Food and beverages, beer and wine, OCRT, surrounding farm tours, verandah, garden, visiting historic sites and photography, fishing and swimming, tours of goldmine, walking, local transportation.		Timber
31	Tiroiti	Tiroiti- Hyde and Tiroiti- Kokonga	2×Camp	RB	-	-	OCRT, visiting historic buildings and sites, tunnels and bridges, landscape views, walking and picnic.		Restored buildings and infrastructures made from local materials
32	Kokonga	Kokonga Lodge	1×B&B	New	Dining room, full laundry facilities, tea, coffee making area, TV, internet access.	All rooms with bathroom, hairdryer, toiletries, heater and lighting.	Local food, wine, beer, non-alcoholic drinks, OCRT, rural art deco town of Ranfurly, gold mining heritage exploring, rural and garden views, biking, fishing, 4WD tour, painting and photography, curling and winter sports in Naseby.		Timber
33	Kokonga	Kokonga Cottage	1×SC	New	Fully equipped kitchen, two bedrooms share a bathroom with bath and shower, laundry, dining	Two bed rooms with heating and lighting.	Local food, wine, beer, non-alcoholic drinks, OCRT, rural art deco town of		Timber

					room, TV.		Ranfurly, gold mining heritage exploring, rural and garden views, biking, fishing, 4WD tour, painting and photography, curling and winter sports at Naseby.		
34	Kokonga	2Wheel Backpackers	1×Bp	New	Full kitchen facilities, shared bathroom and toilet facilities, dining room, lounge, outdoor furniture, TV, BBQ.	Bunkroom (4× single bed) and 1 private room with heating and lighting.	Continental breakfast, OCRT, rural art deco town of Ranfurly, gold mining heritage exploring, Taieri river, landscape views, fishing, waking, painting and photography quiet and peaceful place.		Timber
35	Pareau/Styx	Styx Hotel	Privet holiday-home	RB	NA	NA	Open for public visit, New Zealand's only example of a scroll plain wetland, a common system in Australia, known there as billabongs. Privet holiday-home does not function as OCRT accommodation service.		Stone and timber
36	Patearoa	Patearoa Hotel + 7 Chalets	1×Hotel	RB	Shared bathrooms and toilets, dining room, 7 historic chalets.	1 bedroom has en-suite bathroom, all 4 rooms with lighting and [heating].	Food and breakfast, OCRT, exploring historic sites and buildings, walking.		Red brick and timber
37	Waipiata	Historic Waipiata Country Hotel	1×Hotel	RB	Restaurant, country style bar, guests lounge, disabled facilities, BBQ,	All rooms with either en-suites or private bathrooms, heating and lighting.	Food and beverages, wine and beer, OCRT,		Mud brick walls and

					TV.		newspapers and magazines, chat with locals, discover local sights which include the historic Hamilton's goldfields cemetery		timber
38	Waipiata	Komako Peonies & Cottage Garden (the station building)	1×B&B	New	Fully equipped kitchen, laundry facilities, BBQ.	All bedrooms with separate shower, private toilet, electric blankets, heating and lighting.	Food, continental breakfast, OCRT, historic Hamilton's goldfield and cemetery, the old Waipiata sanatorium, garden views, curling at Naseby, fishing and hiking.		Timber
39	Waipiata	Komako Peonies & Cottage Garden (the bank)	1×B&B	New	Fully equipped kitchen, laundry facilities, BBQ.	All bedrooms with separate shower, private toilet, electric blankets, heating and lighting.	Food, continental breakfast, OCRT, historic Hamilton's goldfield and cemetery, the old Waipiata sanatorium, garden views, curling at Naseby, fishing and hiking.		Concrete
40	Waipiata	Komako Peonies & Cottage Garden (the tool shed)	1×B&B	New	Fully equipped kitchen, laundry facilities, BBQ.	All bedrooms with separate shower, private toilet, electric blankets, heating and lighting.	Food, continental breakfast, OCRT, historic Hamilton's goldfield and cemetery, the old Waipiata sanatorium, garden views, curling at Naseby, fishing and hiking.		Timber
41	Waipiata	Peter's Farm Lodge – the homestead	1×Homestead	RB	Full kitchen facilities, 2 outdoor bathrooms and toilets, laundry, washing	All bed rooms with heater and lighting.	Food, continental breakfast, OCRT,		Rock (from local quarry-

					machine and dryer, BBQ.		exploring historical areas, free kayaks, gold pans, fishing rod, exploring historical area.		mud brick-limited milled timber
42	Waipiata	Peter's Farm lodge – cabins	1×Homestead	New	2 outdoor bathrooms, shared homestead facilities, private garden setting.	All bed rooms with heater and lighting.	Food, continental breakfast, OCRT, exploring historical areas, free kayaks, gold pans, fishing rod, exploring historical area.		Timber
43	Waipiata	Tregonning Cottage	1×SC	RB	Country size-kitchen, [shared bathroom and toilet], dining room, metro log fire, guests lounge, TV, BBQ and picnic area outside or under the sheltered verandah.	All bedrooms with electric blankets, heaters, and lighting.	OCRT, the Waipiata township, the Taieri river, surrounding sheep and beef farm, farm tour, gold panning, kayaking, fishing local transportation along the rail trail.		Mud brick and schist stone
44	Waipiata	Waipiata Cottage	1×B&B	RB	Equipped kitchen, bathroom and toilet, lounge, fire place.	All bedrooms have heating and lighting.	Wine, OCRT, the Waipiata township, the Taieri river, scenery, walking.		Timber
45	Waipiata	Waipiata Motel	1×Motel	New	-	All bedrooms have private bathroom with heater and hair dryer, wall heater and lighting, small kitchenette with microwave and coffee and tea making, TV.	Continental breakfast, wine and beer, OCRT, scenery, visiting historic places, walking and photography.		Timber and glass
46	Ranfurly	Plains Retreat, Ranfurly Hospital	1×Hotel	RB	Two bathrooms, living room.	All bedrooms have heater and lighting.	Continental breakfast, wine and beer, OCRT, surrounding garden, art deco town of		Red brick

							Ranfurly, historic villages such as Wedderburn, Naseby, St Bathans, tour to visit historical places and landscape, viewing scenery, local transportation along the OCRT.		
47	Ranfurly	Railway Cottage	1×SC	RB	Kitchen, dining room, guest lounge, fireplace, outdoor sitting with BBQ facilities.	1 ensuite and 1 private bathroom, all bedrooms have heater and lighting.	Continental breakfast, wine and beer, OCRT, surrounding garden, art deco town of Ranfurly, historic villages such as Wedderburn, Naseby, St Bathans, tour to visit historical places and landscape, viewing scenery, local transportation along the OCRT.		Timber
48	Ranfurly	Annerly House	1×B&B	New	Kitchenette with refrigerator, coffee and tea making, guest bathroom, children's playground, laundry with washing machine, courtyard garden, guest lounge with balcony, verandah, CD player, TV and video cassette player.	All bedrooms with heating and lighting.	Food and continental breakfast, home baking, OCRT, art deco town of Ranfurly, historic villages such as Wedderburn, Naseby, St Bathans, landscape views, books and magazines, walking, ideal stop for horse trekkers.		Timber
49	Ranfurly	Hawkdun Lodge	1×Motel style	New	Equipped kitchen, gas fire, outdoor BBQ for dining and socializing	Each suite has bathroom and toilet, cooling, coffee and tea making, microwave, TV,	OCRT, Ranfurly, historic villages such		Assumed concrete,

					with other guests, indoor spa room with a large (8person) spa pool, laundry with a tub, two washing machine, two dryers, internet access, heat pump for air conditioning for summer and heating for winter, 45" TV (used for conference).	lighting.	as Wedderburn, Naseby, St Bathans conference facilities ,tour around the historic gold mining sites and lunch in one of historic pubs, garden tour (Clachanburn country garden), high country experience (full day and half day) ,4 wheel drive excursion.		wood
50	Ranfurly	Moyola Art Deco Guest House	1×SC	RB	Equipped kitchen, coffee machine, 1 spa bathroom with shower and 1 standard bathroom, gas fire, laundry with washing machine and dryer, covered outdoor spa pool (up to 8 persons), outdoor BBQ area, guest computer, a communal large plasma TV.	All rooms with private sky TV, heating and lighting.	Food and beverages, continental breakfast, OCRT, art deco town of Ranfurly, art deco museum, art deco weekend, guided art deco walks, historic tour in the art deco car (1949 Chevy), 4wd high country tours, garden tour horse treks, mustering experiences, golf, fishing, mountain biking, curling and ice sport (at Naseby), railway station museum, early settlers museum.		Red brick
51	Ranfurly	Old Post Office (B&B)	1×B&B	RB	Full kitchen facilities for self catering, showers, log fire, laundry/ launderette on site, tea and coffee	All rooms are on a shared facilities basis, heated by communal log fire, lighting.	OCRT, art deco town of Ranfurly, Naseby (curling, ice luge and		Red brick and concrete

					making facilities, BBQ.		ice skating in winter), DVD hire, books and games, exploring the Oteake conservation park, exploring the painters and photographers' paradise.		
52	Ranfurly	Old Post Office (backpackers)	1×Bp	RB	Full kitchen facilities for self catering, showers, log fire, laundry/ launderette on site, tea and coffee making facilities, BBQ.	All rooms are on a shared facilities basis, heated by communal log fire, lighting.	OCRT, art deco town of Ranfurly, Naseby (curling, ice luge and ice skating in winter), DVD hire, books and games, exploring the Oteake conservation park, exploring the painters and photographers' paradise.		Red brick and concrete
53	Ranfurly	Ranfurly Holiday Park – motel double studio	1×Motel	New	kitchen with cooking facilities, fridge, microwave, gas cook top, electric oven, bathroom with shower, toilet and hand basin, laundry with gas hot water, tea and coffee making facilities, BBQ, wireless internet and TV.	All bed rooms with heating and lighting.	Continental breakfast, OCRT, local events (February – A & P show, art deco festival, rail trail Duathlon, goldfields Cavalcade, March – Waipiata Ute Muster, April – Ranfurly Easter markets, Bards Ballads & Bulldust, May – duck shooting season opens, June – Brass Monkey motorbike rally, July – Naseby ice		Timber
54		Ranfurly Holiday Park – motel studio (sleeps 4)	1×Motel	New	Kitchen with cooking facilities, fridge, microwave, gas cook top, electric oven, bathroom with shower, toilet and hand basin, laundry with gas hot water, tea and	All bed rooms with heating and lighting.			Timber

					coffee making facilities, BBQ, wireless internet and TV.		festival, Highland Ball August – 100% pure winter games, October – labour weekend markets, vintage car swap meet), Hayes engineering works, rail trail adventure tours, Taieri Gorge railway, Otago fish & game, Otago goldfields, bike-car and coach hire.		
55	Ranfurly	Ranfurly Holiday Park – motel studio (sleeps 5)	1×Motel	New	Kitchen with cooking facilities, fridge, microwave, gas cook top, electric oven, bathroom with shower, toilet and hand basin, laundry with gas hot water, tea and coffee making facilities, BBQ, wireless internet and TV.	All bed rooms with heating and lighting.			Timber
56	Ranfurly	Ranfurly Holiday Park – one bedroom motel unit	1×Motel	New	A kitchen with cooking facilities, fridge, microwave, bathroom with shower, toilet and hand basin, TV.	All bed rooms with heating and lighting.			Timber
57	Ranfurly	Ranfurly Holiday Park – double cabin	1×SC	New	Communal kitchen and bathroom with gas hot water, wireless internet.	All bed rooms with heating and lighting.			Timber
58	Ranfurly	Ranfurly Holiday Park – cabin (sleeps 4)	1×SC	New	Communal kitchen and bathroom with gas hot water, wireless internet.	All bed rooms with heating and lighting.			Timber
59	Ranfurly	Ranfurly Holiday Park – cabin (sleeps 5)	1×SC	New	Communal kitchen and bathroom with gas hot water, wireless internet.	All bed rooms with heating and lighting.			Timber
60	Ranfurly	Ranfurly Holiday Park – two bedroom cabin(sleeps 8)	1×SC	New	Communal kitchen and bathroom with gas hot water, wireless internet.	All bed rooms with heating and lighting.			Timber
61	Ranfurly	Ranfurly Holiday Park – powered sites (8 person)	1×Camping	-	Sites are sheltered, with level ground and heaps of room to spread out, use of the communal cooking, bathing and laundry facilities.	-		-	-
62	Ranfurly	Ranfurly Holiday	1×Camping	-	Sites are well sheltered,	-		-	-

		Park –non- powered sites (8 person)			with level ground and heaps of room to spread out, use of communal cooking, bathing and laundry facilities.				
63	Ranfurly	Ranfurly Motel	1×Motel	New	Fully equipped guest laundry, vanity, wireless internet, gas BBQ, 21"TV.	All six unites have kitchen with cook top / full stove, microwave, ensuite with shower and toilet. All bedrooms with electric blanket, heating, lighting and Sky TV.	Food and beverages, breakfast , OCRT, motel is one of Ranfurly's art deco history and cultural themes, Ranfurly swimming pool, Naseby curling, Ranfurly bike hire, Ranfurly's own art deco gallery, high country 4WD tour, visiting goldfields, tour fishing, walking and mountain biking.		Assumed timber
64	Ranfurly	Ranfurly Lion Hotel	1×Hotel	RB	Shared facilities (showers and toilets for 8 rooms), self service TAB & gaming, coin-operated washing machine and dryer, wireless internet, sports bar with 60-inch TV.	Ensuite for 7 rooms (shower and toilets), all rooms with heating and lighting.	Food and breakfast, wine and liquers, OCRT, cultural events (the Ranfurly art deco weekend held each year), visiting landscapes and scenery, TONI's TIKI tours.		Red brick, timber,
65	Ranfurly	Trail Blazers B&B (and farm adventures)	1×B&B	New	Kitchen, two shared bathrooms with separatetoilets, guests lounge, hot outdoor bath, outdoor BBQ, TV.	All bedrooms with heater and lighting.	Food and breakfast, OCRT, art deco town of Ranfurly, 850 hectare farm, farm tour (paddock tour) and walking, views of the Kakanui and		Timber

							Hawkdun, feeding animals, curling and winter sports at Naseby, grazing for those doing the OCRT on horseback, local transportation along the OCRT.		
66	Ranfurly	Trout 'n' Trail B&B	1×B&B	N/A	N/A	N/A	N/A	N/A	N/A
67	Wedderburn	Mt Ida Station Farm stay	1×SC	RB	Fully equipped country kitchen, shower and toilet, and outdoor spa pool, laundry with washing machine, paddocks, log burner, TV and DVD player.	All bedrooms with heating and lighting.	Continental breakfast, OCRT, 8000 hectare high country sheep station, library of movies including kid's favorites, farm tour.		Timber
68	Wedderburn	Wedderburn Lodge and Cottages (lodge)	1×SC	RB	Fully equipped kitchen with stove, microwave, fridge, toaster, shared bathroom and toilet, BBQ, heat pump, hot water bottles, TV.	All bedrooms with heating and lighting.	Continental breakfast, OCRT, historic sites and buildings, farm tours, 9 hole golf course, fishing, off trail tours, history (DVD) available in the Red Barn.		Red brick and timber
69	Wedderburn	Wedderburn Lodge and Cottages (1 large cottage and 2 small cottages)	3×SC	New	All cottages have their own kitchenette with toaster, jug, microwave, bathroom and toilet, verandah, (one cottage has wheelchair access), tea and coffee making facilities, TV.	All bedrooms with heating and lighting.	Continental breakfast, OCRT, landscape view, farm tour, off trail tours, golf and fishing.		Timber
70	Wedderburn	Wedderburn Tavern	1×B&B	RB	Sitting room, log burner, [bathroom and toilet], BBQ, TV, DVD player.	Bedrooms with lighting. (N/A heating system).	Food and beverages, fruit, beer and wine, OCRT, basketball, 9-		Mud brick-sun-dried mud brick

71	Wedderburn	Wedderburn Tavern	1×Camping(Tent)	-	Tent sleeps 6 guests.	-	hole golf (clubs for hire), historic sites and outstanding landscapes, DVDs.	-	-
72	Wedderburn	Wedderburn Tavern	1×Camping	-	Freedom camping site			-	-
73	Danseys Pass	Danseys Pass Hotel	1×Hotel	RB	Dining room and verandah, Log fire.	Ensuite and double rooms with bathroom and toilet, heating and lighting.	Food and beverages, breakfast, OCRT, books, conference facilities (a whiteboard, overhead projector, fax, email [internet]), clay target shooting, curling, mountain biking, gold panning, trekking and horse riding, fishing (world famous), tennis, swimming, 4WD tours to surrounding mountainous tussock country.		Stone
74	Danseys Pass	Short Lands Station Farm stay	1×B&B	New	3 separate bathrooms, log fire, sitting room.	All bed rooms with lighting, (N/A heating system for bedrooms).	Food and beverages, OCRT, curling (in Naseby), mountain scenery and wilderness.		Red brick and timber.
75	Naseby	Ancient Briton Hotel	1×Hotel	RB	Fully equipped kitchen, 4 rooms with shared bathrooms, sitting room with fireplace.	12 bedrooms with ensuite, all rooms have tea and coffee making facilities, [heating] and lighting.	Food and beverages, breakfast, OCRT, Bards Ballads & Bullust (annual festival), heritage museum, forest walks, mountain biking, curling, annual events, ice skating, swimming		Brick and timber

							and tennis, Art, Sculpture & Gardens (studio gallery), Ballarat cottage (art museum), Naseby town garden, local café, fishing and hunting, Otago tour fishing, gold panning, golf, 4WD & horse trekking.		
76	Naseby	Larchview Holiday Park (tourist flat)	1×SC	New	Adventure playground, adjacent swimming dam, coin operated shower, coin operated washing machine and dryer, dump point for van waste, caravan storage, bike hire, toboggan hire, wheat bag hire, hot water heated by solar energy, BBQ, wireless and kiosk internet access, free view TV in the main amenity block.	Fully equipped kitchen, shower and toilet, heated by log burner.	Food and beverages, OCRT Naseby, historic sites and buildings, mountain biking, swimming, curling, lugeing, ice skating, 4 wheel driving, gold panning, forests walks, scenery.		Timber
77	Naseby	Larchview Holiday Park (miners cottage) ¹	2×SC	RB		Fully equipped kitchen, modern shower and toilet, log burner, heater and lighting.			Timber
78	Naseby	Larchview Holiday Park (10 chalets)	10×SC	New		Each chalet has heater, jug, toaster, crockery lighting.			Assumed timber
79	Naseby	Larchview Holiday Park (3 cabins)	1×B&B	New		Heaters, occupants supply crockery, utensils.			-
80	Naseby	Larchview Holiday Park (48 powered sites)	48×camping	-		These sites include 4 caravans.			-
81	Naseby	Larchview Holiday Park (24 non-powered sites)	24×Camping	-		24 available			-
82	Naseby	Mountain View (cottage)	1×SC	New	Equipped kitchen, living area with log fire, laundry facilities.	Each bedroom has ensuite bathroom, electric blanket, heater and lighting.	Continental breakfast, OCRT, Naseby, historical sites and buildings, indoor curling all year, outdoor curling and luge from June to September, mountain		Timber
83	Naseby	Mountain View (2 ensuite units)	1×B&B	New	Each unit with tea and coffee making, microwave, fridge, BBQ and TV.	Ensuite bathroom, each bedroom with electric blanket, heater and lighting.			Timber
84	Naseby	Mountain View (tourist flat)	1×B&B	New	Limited cooking facilities.	, Ensuite bathroom, each bedroom with hairdryer heater			Timber

						and lighting.	biking, hiking, forest walks.		
85	Naseby	Mountain View (the house with 3 bed rooms)	1×SC	New	Fully equipped kitchen, laundry, verandah, heat pump.	Ensuite bathroom, separate toilet equipped with disabled facilities, each bedroom with hairdryer, heater and lighting.			Timber
86	Naseby	Naseby Trail Lodge (6 one bedroom units)	1×SC	New	Each one unit has private timber deck verandah, Italian leather sofa, European style kitchen, central heating, iron and ironing board, internet access, microwave, toaster, heated towel rail, TV, telephone	6 ensuite bathrooms with under floor heating, wheelchair access bathroom (unit 1), each bedroom has reading lamps, radio alarm clock, and hair dryer and lighting.	Continental and/or cooked breakfast, OCRT, Naseby, year-round, curling, winter lugeing, winter ice skating, year round mountain biking, golf, river and lake fishing, 4WD adventures, horse treks.		Timber-aluminum façade, wooden joinery
87	Naseby	Naseby Trail Lodge (2 two bedroom units)	1×SC	New	Each units has kitchen with microwave, cooking hob, dishwasher, toaster, kettle, fridge , central heating, iron and ironing board, separate lounge with sofa (converts to innersprung double bed), TV, internet access.	Each unit has separate bathroom with under floor heating, wet-area shower, heated towel rail, hair dryer, toiletries. Each bedroom has reading lamps, telephone, radio alarm clock and lighting	Continental and/or cooked breakfast, OCRT, Naseby, year-round, curling, winter lugging, winter ice skating, year round mountain biking, golf, river and lake fishing, 4WD adventures, horse treks.		Locally made mud-brick
88	Naseby	Old Doctor's Residence	1×B&B	RB	Guest lounge with tea and coffee making facilities, TV, DVD, broadband access.	Private bathroom, hair dryer, ironing, heated towel rail, heating and lighting.	Food ,special breakfast, homemade baking, wine, OCRT, the gold fields , magazines, a library, music and games, curling,4WD tour, mountain biking, fishing, golf, day walks in the Manitoto,		Clay brick, timber

							wildflower walks, horse riding.		
89	Naseby	Royal Hotel (hotel)	1×Hotel	RB	Bar and cafe, large open fire, Sky TV, outdoor patio, banquet room (used for meetings and conferences).	Each bedroom has bathroom and toilet (one suitable for disabled), heating and lighting.	Food, wine and beer, beverages, homemade biscuits and cakes, OCRT, mountain biking, curling, goldfield heritage, museum, golfing, fishing, hunting, 4WD, horse riding, walking, regular events, upcoming events.		Timber
90	Naseby	Royal Hotel (self contained)	1×SC	RB	Self contained uses shared facilities with hotel.	Each bedroom with ensuite bathroom, heating and lighting.			Timber
91	Oturehua	Crowsnest Accommodation (bunkrooms/lodge)	1×Bp	New	Kitchen, toilet, bathroom, outdoor cooking and eating area.	Each bedroom heating and lighting.			Timber
92	Oturehua	Crowsnest Accommodation (2 cabins)	2×SC	New	Both cabins have small kitchen, toilet and bathroom.	Bothe cabins with heating and lighting.			Timber
93	Oturehua	Crowsnest Accommodation (the Bach).	1×SC	New	Shared shower with the lodge.	The Bach has a private kitchen, toilet, heating and lighting.			Timber
94	Oturehua	Crowsnest Accommodation (tent sites and powered sites)	1×Camping	-	Guest toilet, bathroom, laundry facilities, outdoor bath, hot tub (does not use electricity have a pump or need chemicals), BBQ area.	-			-
95	Oturehua	Hawk Rock Cottage	1×B&B	New	Full equipped kitchen with freezer, fridge, dishwasher, microwave and toaster, fireplace, shower, fire wood supply, washing machine, iron, BBQ, TV& DVD player, cell phone coverage.	3 bedrooms have hair dryers, heating and lighting.	Continental breakfast, OCRT, natural views and landscape, (children welcome), fishing, Oturehua local village, historic buildings, historic		Stone

							Hayes Engineering, Golden progress mine (heritage), 4WD tour.		
96	Oturehua	Hill Creek Hideaway	1×B&B	New	Shared bathroom with separate shower.	Bedrooms with lighting and heating.	Continental breakfast, food, OCRT, Oturehua local village, historic sites and buildings, views of Hawkdun and Rough Ridges ranges, local transportation.		Assumed concrete
97	Oturehua	Inver Lair lodge	1×B&B	New	Full kitchen, wheelchair friendly facilities, outdoor spa pool, fire place, BBQ, TV and DVD player.	6 stylish ensuite rooms with bathroom, toilet, heating and lighting.	BBQ packed lunch (meats, bread & salad), OCRT, book and DVDs, curling, ice luge, 4WD tour, hunting and fishing, golf.		Stone
98	Oturehua	Oturehua Lodge & Cottage (1Queen, twin rooms cottage)	1×B&B	New	Indoor heated pool, spa, sunroom/ reading room, games room. Each cottage has kitchen, fire place and TV.	Each cottage with private bathroom and toilet, heating, lighting.	OCRT, side trips to Naseby and St Bathans, access to nearby places, activities and attractions books and magazines, touring, trekking, fishing, hunting.		Timber
99	Oturehua	Oturehua Lodge & Cottage (1 × 2 bedroom cottage)	1×SC	New		Each cottage with private bathroom and toilet, heating, lighting.			Timber
100	Oturehua	Oturehua Lodge & Cottage (2 × studio cottage)	1×SC	New		Each cottage with private bathroom and toilet, heating, lighting.			Timber
101	Oturehua	Oturehua Tavern and Self Contained	1×SC	RB (tavern) New SC	Kitchen sink and crockery, shower, BBQ.	Heating and lighting	Home cooked meals, continental breakfast, vegetable, beverages (alcoholic and non-alcoholic), beer garden, OCRT, Hayes engineering, curling, fishing, historic gold mine site.		Container-cottage

102	Oturehua	The Mill B&B	1×B&B	RB	Separate lounge with Sky TV, twin room with shared facilities.	Two bedrooms with claw foot bath and a shower, all bedrooms with heating and lighting.	Full country breakfast, OCRT, [using Oturehua attractions].		Quarried stone
103	Oturehua	The Old Shop B&B	1×B&B	RB	Full bathroom, sitting room with tea and coffee making facilities.	Bedrooms with heating and lighting.	OCRT sheltered garden, central Otago's summer skies, Hayes Engineering works, gold mine sites.		Assumed timber
104	St Bathans	Cambrian Station	1×SC	RB	Fully equipped kitchen including fridge/freezer, microwave, stove/oven, fully facility bathroom, heaters and hair dryer, TV, radio, stereo, washing machine, BBQ, (firewood provided), separate laundry area with extra toilets and showers.	Bedrooms with heating and lighting.	OCRT, Otago gold fields, St Bathans historic mining township, Blue lake, games and books.		Mud brick
105	St Bathans	Constable Cottage & Gaol (cottage)	1×Sc	RB	Kitchen, lounge, bathroom and toilet, TV.	Bedrooms with heating, lighting.	Continental breakfast, meals are available at Vulcan hotel, OCRT, explore the township and its buildings, the remnants of 19 century gold mining, Oteake conservation park, neighbouring historic towns, ice skating and curling at Naseby or Alexandra, art deco architecture at Ranfurly, visit Ophir and Daniel O'Connell memorial bridge, Blue lake.		Timber
106	St Bathans	Constable Cottage & Gaol (gaol)	1×SC	RB	Small kitchen, TV.	Heating and lighting.			Timber

107	St Bathans	Lombardy Cottage	1×SC	RB	Kitchen- sitting room , two bathrooms, under floor heating, an open fire, coal range and oil-fired heater, a laundry facilities, gas BBQ, an outdoor hot tub, stocked woodshed, high speed internet.	Bedrooms with heating and lighting.	OCRT, wine and beer, an in-season vegetable garden, a book-lined study, scenery, historic sites and buildings, kayaking, mountain biking.		Stone
108	St Bathans	Lombardy Cottage (caravan)	1×SC	New	-	4.5m , 1977 Zephyr caravan which sleeps four (two singles and a double berth), with an additional queen bed	Using shared products and attractions which are available at the cottage.	-	-
109	St Bathans	St Bathans B&B	1×B&B	New	Sitting room with lounge, wood burner.	All bedrooms have bathroom, toiletries, tea/coffee making facilities, free DVDs, heating and lighting. 2 rooms have private balcony.	Food and full cooked breakfast, OCRT, the village of St Bathans, Otago goldfields' park, historic precinct with the original buildings, seasonal vistas, art works for sale, kayaking, horse riding, boating, fishing, rabbit shooting, swimming, Triathlon track, photography, ice skating, falls dam.		Timber
110	St Bathans	Vulcan Hotel	1×Hotel	RB	Self-catering kitchen, shared bathroom facilities, a deep bath, and veranda, TV / CD player.	All bedrooms with heating and lighting.	Food and breakfast, OCRT, Blue lake, lunar landscape, historical buildings and sites, walking, photography share, using products and attraction which are available at adjacent towns and		Mud brick

							villages.		
111	Ida Valley	Parkside Farm Stay	1×B&B	New	Shared bathroom facility, sleep-out with a double and single bed.	All bedrooms with heating and lighting.	Farm meals, OCRT, historic site and buildings, country garden, scenery, Ida valley, 816 ha farm, farming activities, farm tour, walking , fishing curling (at Naseby), mountain bike, golf, photography.		Assumed timber
112	Auripo	Poolburn Hotel	1×Hotel	RB	Dining room, shared garden bar, 3 shared bathrooms, outdoor sitting with BBQ area.	Bedrooms with lighting. (Heating information N/A).	Food, wine and beer, OCRT, Poolburn Gorge, historic sites and buildings, photography, landscape view, using products and activities at adjacent towns and villages such as Omakau and Ophir and Naseby.		Mud brick and timber
113	Auripo	Taradale Homestead	1×Homestead	RB	Shared sun-room, dining room.	Ensuite (one room), private shower and toilet, heating and lighting.	Continental breakfast, home cooked dinner, OCRT, fishing, curling, skating, tour Hayes historic engineering works, visit gold mine, historic store and museum (Oturehua) Naseby and Ophir.		Mud brick

114	Becks	White Horse Hotel	1×Hotel	RB	7 rooms with shared facilities including bathrooms and toilets, 2 sitting rooms, dining room.	All bedrooms with heating and lighting.	Food, continental breakfast, wines, OCRT, visiting historical sites and buildings, adjacent villages and town, fishing, curling, horse riding, ice skating, scenery and photography, local transportation along the OCRT.		A mixture of timber and stacked stone schist slabs with corrugated iron roof.
115	Lauder	Big Sky Cottage	1×SC	RB	Equipped kitchen (electric cooker and oven, fridge freezer, microwave), bathroom with shower, heated towel rail and heater, hair dryer, log burner, washing machine and ironing facility, veranda, sheltered sun-trap garden, TV, DVD player, CD/radio, tape player.	All bedrooms with electric blanket, oil filled electric heater and lighting.	Continental breakfast, OCRT, wine, books, maps and local information, selection of CDs, DVDs and tapes, historical bridges, historic sites and buildings, walking, fishing, ice skating and curling at Naseby, landscape view and photography.		Mud brick
116	Lauder	Lauder Rail Trail School and Milmor Cottage (3 school ensuite rooms)	1×B&B	RB	Kitchen, spa pool and school garden (share with other Lauder Rail Trail School and Milmor accommodation options), TV and wireless internet.	Each of 3 ensuite rooms with bathroom and toilet, hairdryer, electric blankets, heating and lighting.	Continental breakfast, home baking, wine and beer, OCRT, library, art room, historic bridges and tunnels, historic adjacent sites, garden tour, villages and towns, horse riding, goldfield mining, fishing, golf, curling		Timber
117	Lauder	Lauder Rail Trail School and Milmor Cottage (studio cottages)	1×SC	New	Kitchen, spa pool and school garden (shared with other Lauder Rail Trail School and Milmor accommodation options), TV and wireless internet.	All cottages with private bathroom and toilet, all bedrooms with heater, electric blankets, hair dryer and lighting.			Timber

118	Lauder	Lauder Rail Trail School and Milmor Cottage (standard rooms)	1×SC	New	Kitchen, spa pool and school garden (share with other Lauder Rail Trail School and Milmor accommodation options), TV and wireless internet.	The cottage with private bathroom and toilet, all bedrooms with heater, electric blankets, hair dryer and lighting.	and ice skating at Naseby, landscape views and photography, local transportation along the OCRT.		Timber
119	Lauder	Lauder Rail Trail School and Milmor Cottage (cabin)	1×SC	New	Small kitchen, use shared bathroom and toilet, using shared facilities with other Lauder Rail Trail School and Milmor accommodation options, TV and wireless internet.	The cabin with heater, electric blankets, and lighting.			Timber
120	Lauder	Lauder Rail Trail School and Milmor Cottage (Milmor cottage)	1×SC	New	Equipped kitchen, shared bathroom, complimented with a second toilet, hairdryers, TV and wireless internet.	3 bedrooms with heating, electric blankets and lighting.			Timber
121	Lauder	Lauder Store B&B (the old store)	1×SC	RB	A kitchen, a shared fully equipped bathroom, guest lounge, outdoor entertaining area with BBQ, multi fuel log burner, electric heater (used for guest lounge), disabled facilities, play ground for children, laundry facilities.	All bedrooms have electric blankets, bedside lights, electric wall heater and lighting.	Food and beverages, OCRT, tours to various historical gold mining sites including Matakanui, Cambrian, St Bathans Naseby and Falls Dam, historic bridges and tunnels, horse riding, fishing, golf course, hiking, mountain biking, winter sports and curling at Naseby, scenery a photography, 4WD tour.		Mix stone and timber
122	Lauder	Lauder Store B&B (Storekeeper house)	1×SC	New	A kitchen, a shared fully equipped bathroom, guest lounge, outdoor entertaining area with BBQ, multi fuel log burner, electric heater (used for guest lounge), disabled facilities, play ground for children, laundry facilities.	All bedrooms have electric blankets, bedside lights, electric wall heater and lighting.			Timber

123	Lauder	Lauder Store B&B (Arkwrights Snug)	1×SC	New	A kitchen, a shared fully equipped bathroom, guest lounge, outdoor entertaining area with BBQ, multi fuel log burner, electric heater (used for guest lounge), disabled facilities, play ground for children, laundry facilities.	All bedrooms have electric blankets, bedside lights, electric wall heater and lighting.			Timber
124	Lauder	Lauder Hotel	1×Hotel	RB	Shared bathroom and separate toilet facilities.	All bedrooms with heating and lighting.	Food and beverages, continental breakfast, OCRT, historical gold mining sites , historic bridges and tunnels, horse riding, fishing, golf course, hiking, mountain biking, winter sports and curling at Naseby, scenery and photography.		Timber with concrete plaster
125	Lauder	Lauder Burn House B&B	1×B&B	RB	Breakfast room, guest lounge with fireplace, 1 shared bathroom and toilet.	2 ensuite rooms with bathroom and toilet and 1 bedroom with 2 single beds with access to the veranda and private lounge. All bedrooms with electric blankets and lighting.	Continental breakfast, food and beverages (available from adjacent hotels),OCRT, small library, private garden, 6 acre surrounding farm, farm tour, visiting historic sites and buildings, restored bridges and tunnels, landscape views, fishing, curling and ice		Brick

							skating at Naseby.		
126	Lauder	Lauderdale Estate (cottages)	1×B&B	RB	4 double with shared bathrooms, 1 twin with shared bathroom, living room, commercial kitchen used for events.	2 double en suite, 1 twin en suite with bathroom and toilet. All bedrooms with heating and lighting.	OCRT, food and beverages, wine, beer, surrounded by farmland , separate 20 acres of park used as sitting area, farm tour, exploring historic sites and buildings, fishing, mountain biking, curling and winter sports at Naseby , landscape views and photography, a centre for wedding celebration and parties.		Stone and mud brick (original buildings)- 100 year old wooden chalets moved from Pleasant valley
127	Lauder	Muddy Creek	1×SC	RB	5 bed rooms, full kitchen with gas stove, electric wok, microwave and fridge ,several resting/ lounging spaces, two shared toilets /bathroom with under floor heating, 5-person sauna, an open fire and a garden room, a piano, TV and landline phone.	All bed rooms with heating and lighting.	Farm made food and vegetables, OCRT, farm tour, exploring historic sites and buildings, fishing, mountain biking, curling and winter sports at Naseby, walking, landscape views and photography.		Mud brick
128	Lauder	Pedal Inn	1×SC	RB	Two cottages each has kitchenette that has microwave, fridge and sink, coffee and tea making facilities.	Two cottages each has ensuite bathroom, one with disabled access. All bed rooms with heating and lighting.	Continental breakfast and/or farm fresh eggs, OCRT, 485 ha farm, farm tour, exploring historic sites and buildings, fishing,		Assumed timber

							mountain biking, curling and winter sports at Naseby , landscape views and photography.		
129	Moa Creek	Bonspiel Station & Old Moa Creek hotel	1×Hotel	New	4 rooms plus sleep out, Spa and sauna, two bathrooms, a lounge and a separate bar area are all fully furnished, using 2 open fire places for warming the rooms.	Sleeping bags required.	OCRT, heritage exploring, walking, mountain biking, riding the Dunstan Trail, gold panning, river swimming, canoeing, fishing, hunting, 4WD driving. Chinese miner's hut (as accommodation without electricity and running water).		Stone
130	Poolburn	Poolburn Hotel	1×Hotel	RB	Three shared bathrooms, dining room, garden bar, BBQ.	8 rooms with heating and lighting.	Food, wine and beer, OCRT, exploring historic sites and buildings, visiting Poolburn dam (film site of Rohan), mountain biking, road biking, kayaking, fishing, curling and ice skating at Naseby.		Timber
131	Poolburn	Solandra Lodge country style B&B	1×B&B	New	Self contained kitchen with microwave, oven, full size fridge freezer, dishwasher, 1 shared bathroom and a separate toilet with under floor heating, 1 kitchenette, two lounges, 2 heat pumps, TV/ DVD, projector,	All bedrooms with under floor heating and lighting.	Food, wine and beer, OCRT, exploring historic sites and buildings, visiting Poolburn dam (film site of Rohan) , mountain biking, road biking, kayaking,	120sqm	Timber

					surround sound.		fishing, curling and ice skating at Naseby, bike hire.		
132	Ophir	Blacks Hotel	1×Hotel	RB	Bar, 100 square metre deck, dining room.	All 10 rooms with ensuite (bathroom and toilet), heating, lighting, two rooms have disabled facilities.	Food and bar meals, wine, beer, OCRT, beer garden, Naseby, Ranfurly and St. Bathans, visit the Daniel O'Connell bridge, Manuherikia river, fish for trout, Ophir walk, 4WD tracks, golf and tennis, local transportation along the OCRT.		Timber
133	Ophir	Flannery Lodge	1×B&B	New	Full kitchen, shared bathroom and toilet (for bunkrooms), BBQ, wireless internet, laundry, TV.	Double rooms, both with ensuite, bunkrooms, four or five to a room, backpacker style, all rooms with heating, lighting.	Food, vegetables, wine and beer, OCRT, books, Naseby, Ranfurly and St. Bathans, visit the Daniel O'Connell bridge, Manuherikia river, fish for trout, Ophir walk, golf and tennis, local painting, photography workshop, tour (The Best Bits tour), fishing.		Concrete blocks
134	Ophir	Flannery Lodge (tent site)	10×Camping	-	-	25 person	Food, vegetables, wine and beer, OCRT, books, Naseby, Ranfurly and St. Bathans, visit the Daniel O'Connell bridge, Manuherikia	-	-

							river, fish for trout, Ophir walk, golf and tennis, local painting, photography workshop, tour (The Best Bits tour), fishing.		
135	Ophir	Millfield Cottage	1×SC	New	Fully furnished kitchen, fridge/freezer, dishwasher, shower, toilet facilities, laundry, a log burner, lounge and dining area, BBQ on the deck outside, Sky TV, DVD player.	All bedrooms with heating and lighting.	Continental breakfast, OCRT, rural views, 20 minutes from Alexandra, and walking distance from historic Ophir and Omakau township with shops, pub, swimming pool and a golf course, fishing and swimming in Manuherikia river.		Timber
136	Ophir	Ophir Bridge B&B	1×B&B	New	A shared bathroom with under floor heating, complimentary Nellie Tier toiletries, hairdryer.	2 bedrooms each with access to its own outdoor area,, heating and lighting.	Continental breakfast with homemade products (yoghurt, fresh fruits, muesli etc), beverages, OCRT, Ophir Village walk, Matakanui and Drybread, St Bathans and Cambrian, golf at Omakau, Poolburn dam, Thompsons Gorge, Clyde, Alexandra Basin Vineyards, Hayes Engineering, 4WD trips, word class gardens, curling and		Assumed concrete

							luge at Naseby, historic sites and landscape.		
137	Ophir	The Old Bakery (Stables building)	1×B&B	RB	Full kitchen, bathroom facilities, washing machine, log burner, BBQ, outdoors area ,TV, a selection of DVDs.	All bedrooms with heating and lighting.	Homemade breakfast, farm fruits and eggs, OCRT, walking, historic Ophir, visiting historic buildings and sites, landscape views and photography, fishing, swimming, golf course.		Schist stone
138	Ophir	The Old Bakery (Bakery)	1×B&B	RB	Shared outside-bathroom and toilet, using shared facilities with stables building.	2bedrooms with lighting and [heating].			Schist stone
139	Omakau	Church Hill B&B	1×B&B	RB	Twin room with shared facilities (bathroom and toilet), lounge and dining area, open fire, tea and coffee making facilities, outdoor areas, grazing for horse trekkers, TV, DVD player, stereo.	Queen room with ensuite, bathroom and toilet, all bedrooms with heating, lighting.	Breakfast, food (from other restaurants and hotels), wine, OCRT, historic Ophir, adjacent historic Omakau Catholic Church.		Red brick
140	Omakau	Hawksview B&B	1×B&B	RB	Fully equipped kitchen, bathroom, washing and drying facilities, outdoor spa pool, garden sitting, BBQ, lounge with TV, free email access.	All bedrooms with electric heaters electric blankets and lighting.	Continental breakfast, OCRT, historical sites and heritage, landscape views, photography, Omakau, books, (swimming pool, golf course and astro tennis courts available from other nearby places and accommodation services).		Red brick, timber
141	Omakau	Killarney Cottage	1×SC	RB	Kitchen, two bedrooms	1 bedroom with ensuite. All	OCRT, historical sites		Timber,

					with a separate toilet and shower, dining area, laundry with machine washing, sheltered veranda.	bedrooms with heating and lighting.	and heritage, landscape views, photography, Omakau, books, (swimming pool, golf course and astro tennis courts available from other nearby places and accommodation services).		stucco finish walls
142	Omakau	Omakau Accommodation Cottage & Ensuite Studio Units (units)	1×SC	New	laundry block	5 Studio units each has: ensuite, heating and lighting, a private courtyard that includes outdoor dining and bike stand, TV , each bedroom has radio alarm clock and electric blanket and hair dryer. 1 unit with disabled facilities.	Continental breakfast, wine, OCRT, view of the Dunstan Ranges, Manuherikia river, landscape garden, sports equipments, tennis, golf course, swimming, fishing, walking, local transportation along the OCRT.		Timber
143	Omakau	Omakau Accommodation Cottage & Ensuite Studio Units (cottage)	1×SC	New	Full kitchen facilities with fridge, oven, microwave, dishwasher, one bathroom and toilet, open plan dining and living area with TV and stereo, landscape garden area.	All bedrooms with heating and lighting.	Continental breakfast, wine, OCRT, view of the Dunstan Ranges, Manuherikia river, landscape garden, sports equipment, tennis, golf course, swimming, fishing, walking, local transportation along the OCRT.		Timber
144	Omakau	Omaka bed post (Post Master's House & Post Office), (Post	1×B&B	New	2 bathrooms, 3 toilets, separate lounge with log burner, separate living	All bedrooms with heating and lighting.	Continental breakfast, wine and beer, OCRT,		Red brick

		Master's House)			room.		historical sites and buildings, wine and beer, garden, landscape views, walking, photography.		
145	Omakau	Omaka Bed Post (Post Master's House & post office), (post office)	1×B&B	RB	A fully equipped kitchen, lounge, log burner, bathroom and toilet.	All bedrooms with heating and lighting	Continental breakfast, wine and beer, OCRT, historical sites and buildings, wine and beer, garden, landscape views, walking, photography.		Triple brick walls
146	Omakau	Omakau Commercial Hotel	1×Hotel	RB	5 shared facilities rooms, bar and cafe with Sky TV, fire place, tea and coffee facilities, laundry services, irons and ironing boards, disabled access facilities in cafe, guests TV lounge, internet and wireless broadband.	4 ensuite rooms each with bathroom and toilet, 2 bedroom cabin and bunkroom with adjacent private ensuite. All bedrooms with hairdryer, electric blankets, heaters, lighting and alarm clock.	Food, breakfast, wine, OCRT, garden area, visiting historical sites and buildings, landscape views, conference and function facilities, golf, tennis, swimming, playground, historic Ophir, guided tours.		Schist stone
147	Omakau	Peddl'n Away B&B	1×B&B	New	Fridge and freezer, dining room, dishwasher, cafe/restaurant, guest lounge, laundry facilities, clothes dryer, iron/ironing board, lounge area with fire place, BBQ, TV room, DVD player, internet access.	All beds have electric blanket, shower facilities, toilet facilities.	Continental breakfast, food, wine, OCRT, golf course, tennis courts (5 minutes away).		Red brick
148	Omakau	Tiger Hill Lodge and Wilson's (Tiger Hill Lodge)	1×SC	New	Fully equipped kitchen, 2 lounges, one is used as TV room.	4 ensuite bedrooms (bathroom and toilet), heating and lighting, 1 ensuite includes disabled facilities.	Continental breakfast, food, wine, OCRT, golf course, visiting historic buildings sites, scenery.		Schist stone and timber

149	Omakau	Tiger Hill Lodge and Wilson's (Wilson's)	1×SC	New	Kitchen, communal lounge, TV viewing room, hot tub.	3 bedrooms with three bathrooms and toilets, heating, lighting.	Continental breakfast, food, wine, OCRT, golf course, visiting historic buildings sites, scenery feeding cattle.		Assumed stone, concrete and timber
150	Chatto Creek	Chatto Creek Tavern Budget Accommodation	1×Bp	RB	2 double rooms and 6 bed bunk room with shared bathroom, dining room, bar, beer garden.	All bedrooms with heating and lighting.	Continental breakfast, food, wine, beer garden, OCRT, historic artefacts, walking, visiting historical sites and buildings.		Schist stone and mud walls
151	Chatto Creek	The Magdelans B&B	1×B&B	New	Lounge with Sky TV, selections of DVDs, swimming pool.	Two bedrooms with private bathrooms, heating and lighting.	Continental breakfast and full Irish breakfast, OCRT, beverage, wine and beer, landscape views, guided walks, local transportation along the OCRT.		Assumed timber
152	Chatto Creek	Rockdale B&B	1×B&B	RB	Country style kitchen, wood panelled lounge, two modern bathrooms with claw foot bath.	2 double rooms and 1 bunk room with heating and lighting, one bedroom with fire place.	Food, continental breakfast, OCRT, scenery and landscape views, local transportation to dine at adjacent hotels and restaurant.		Timber
153	Alexander	Avenue Motel	1×Motel	New	Fully equipped kitchen with microwave, guest laundry, BBQ.	All 13 spacious units with bathroom and toilet, heating and lighting, internet access, Sky TV. 3 units with spa baths.	Continental breakfast, OCRT, golf, wine, historic heritage and sites, scenery.		Concrete
154	Alexander	Alexander's Riverview B&B	1×B&B	New	2 bedrooms with shared tiled bathroom, lounge, TV, patio with natural views.	All bedrooms with heating and lighting, 1 bedroom with tiled ensuite.	Continental breakfast, OCRT, historical sites and heritage at Alexandra, iconic steel lattice bridge, the		Assumed timber

							historic Doctors Point Gold Diggings Clutha River, Alexandra walkway, fishing.		
155	Alexander	Alexandra Garden Court Motel	1×Motel	New	Swimming pool, BBQ area, children's playground.	6 self contained units all with electric blankets, dual-heating, oven, microwave, TV, lighting, bathroom and toilet.	Food and beverages, breakfast, OCRT, landscape gardens, 4WD tours, golf, boating, mountain biking, fishing, kayaking, walking tracks, walk to the clock on the hill, ice skating, curling, gun club, bowling greens, new swimming complex, blossom festival, thyme festival, wine tours, vineyard tours.		Timber
156	Alexander	Alexandra Heights Motel	1×Motel	New	BBQ area.	6 spacious studio apartment and 4 spacious 2 bedrooms units, three of studios have spa bath, one of 2 bedroom units has disabled facilities and access. All units with fully equipped kitchen, free wireless internet, Sky TV.	Continental breakfast, OCRT, fishing, boating, golf, cycling, vineyard tour, river cruises, aquatic centre and BMX track.		Concrete and red brick
157	Alexandra	All Seasons Tourists Flats	1×SC	New	Laundry facilities,	All flats with private bathroom, separate lounge with TV and DVD, self catering kitchen with small oven, microwave, fridge, heating and lighting.	OCRT, wine industry, historic and natural heritage, mountain view, close to the historic Shaky Bridge, Alexandra festivals and events (listed in table 2), skiing, fishing		Timber

							(famous for salmon and trout fishing), golf, swimming, tramping, mountain biking.		
158	Alexander	Alexandra Almond Court Motel	1×Motel	New	Swimming pool, guest laundry.	8 units all with kitchen, bathroom and toilet (three of the units have spa bath), one of two bedrooms units has disabled facilities, central heating, lighting, glare reducing tinted glass, thermal drapes, TV, radio, phone, DVD player, wireless internet.	Cooked or continental breakfast, OCRT, daily paper delivered, 33 annual cultural events and activities (listed in table 2), skiing, fishing (famous for salmon and trout fishing), golf, swimming, tramping, mountain biking.		Timber
159	Alexander	Central Court Motor Inn	1×Motel	New	Restaurant, house bar, BBQ for hire, conference centre.	33 units all with ensuite or private bathroom, kitchen or kitchenette with fridge and coffee making facilities, wireless internet, Sky TV, heater, electric blankets and lighting.	Kiwi dishes, continental breakfast, OCRT, local wines, scenery, gold mining heritage, 33 annual cultural events and activities (listed in table 2), conferences and seminars.		Timber, concrete, red brick (used for the conference center building)
160	Alexandra	Criterion Club Hotel (Bp)	1×Bp	New	All 7bedrooms with shared bathroom facilities, beer garden, restaurant.	All bedrooms with heating and lighting.	Food, breakfast, beer, wine, OCRT, 33 annual cultural events and activities (listed in table 2).		Assumed timber and brick
161	Alexandra	Criterion Club Hotel (Bp)	1×Bp	New	A fully equipped kitchen, dishwasher, lounge, beer garden, restaurant.	Ensuite bathrooms, TV (some of rooms), lighting and heating.	Food, breakfast, beer, wine, OCRT, 33 annual cultural events and activities (listed in table 2).		Assumed timber and brick
162	Alexandra	Hawkdun Rise	1×B&B	New	Dining room.	3 bedrooms with 3 separate	Breakfast, local fresh		Timber

		Vineyard Homestay				ensuite bathrooms and verandas, heating and lighting.	fruits, food, Hawkdun Rise wine, OCRT, vineyard, using local grown produce, 33 annual cultural events and activities (listed in table 2), skiing, fishing ,golf, swimming, tramping, mountain biking.		
163	Alexandra	Hillview Park B&B	1×SC	New	Fully equipped and disabled accessible kitchen, a shared bathroom, BBQ, lounge /dining, large trampoline for children wireless internet.	All bedrooms with heating and lighting.	Continental breakfast, food, off - road motorcycle or 4 Wheel drive tour, OCRT, 33 annual cultural events and activities (listed in table 2).		Timber
164	Alexandra	Log House Retreat	1×B&B	New	Dining room, 1 shared bathroom, guest reading lounge, outdoor living area.	3 bedrooms with electric blankets, hairdryer, clock radio, stereo/CD player, tea & coffee making facilities. A queen size suite with ensuite and private lounge.	Breakfast, wine, Pinot Noirs and wine tours, OCRT, guest reading lounge, wedding services, historical countryside, stone fruit, hydro electric dam (related recreational activities), 33 annual cultural events and activities (listed in table 2) .		Timber (log)
165	Alexandra	Marj's Place (Home stay)	1×SC	New	Kitchen, lounge with Sky TV , central heating, 3 person sauna, double spa bath, internet.	All bedrooms with lighting.	Food, wine, Pinot Noirs and wine tours, OCRT, guest reading lounge, wedding		Timber

							services, historical countryside, stone fruit, hydro electric dam (related recreational activities), 33 annual cultural events and activities (listed in table 2).		
166	Alexandra	Marj's Place (Backpacker)	1×Bp	New	4 showers, 3 kitchens, 5 toilets, 2 lounges, central heating, TVs, BBQs, internet in reception.	All beds with lighting.	Food, wine, Pinot Noirs and wine tours, OCRT, guest reading lounge, garden, wedding services, historical countryside, stone fruit, hydro electric dam (related recreational activities), 33 annual cultural events and activities (listed in table 2).		Timber
167	Alexandra	Quail rock B&B	1×B&B	New	Coffee and tea making facilities, reading selection, outdoor seating and tables (for breakfasts), laundry, night storage heating.	All rooms with room heating tiled ensuite bathroom with under floor heating, clock-radio, TV, bedside lamps with touch anywhere on-off, coffee and tea making.	Food, breakfast, OCRT, reading selection, Central Stories Museum & Art Gallery, Alexandra/Clyde wineries and vineyards, central Otago gold heritage, historic gold mines, mountain bike tours.		Timber

168	Alexandra	Speargrass Inn	1×SC	RB	Restaurant	All 3 units with ensuite bathrooms, tea/coffee facilities, TV/DVD player, electric blankets & heater. A disabled access unit is equipped with appropriate bathroom facilities.	Food, breakfast, OCRT, mountain and river views, wine and wine tours, central Otago gold fields, mountain biking, wild flower walks.		Stone
169	Clyde	Absolutely Amazing Workshops B&B	1×B&B	New	Fully equipped guest kitchen, 2 shared bathrooms, guest lounge, games rooms (pool, table tennis and darts), shared outdoor area, garden, BBQ.	All 4 bedrooms with heating and lighting.	Packed food, continental breakfast, OCRT, Clutha River adventures.		Timber and brick
170	Clyde	Antique Lodge Motel	1×Motel	New	Children's playground, guest laundry with dryer, BBQ, TV and stereo, wireless internet.	7 units each has a fully equipped kitchen with microwave, bathroom and toilet, electric blankets, telephone, radio, furnished lounge with Sky TV, heating and lighting, hair dryer.	Continental breakfast, OCRT, Clutha River adventures.		Timber
171	Clyde	Argyll on Clyde bed & Breakfast	1×B&B	New	Lounge, spa, 3 bedrooms with a shared bathroom, BBQ.	1 queen bedroom with ensuite (bath and shower), all bedrooms with heating and lighting.	Breakfast, OCRT, golf and fishing, 4WD tour, historic gold mining heritage, landscape and scenery.		Timber
172	Clyde	Bed and Breakfast @Clyde	1×B& B	New	2 bedrooms with shared bathroom and toilet, internet wireless access.	1 ensuite bedroom with bathroom and toilet, private sitting room, tea and coffee making facilities. All bedrooms with heating and lighting.	Continental breakfast, OCRT, historic village of Clyde, Clutha River, close to the golf course and hospital.		Timber
173	Clyde	Clyde Holiday & Sporting Complex	1×SC	New	Campground toilets and showers, communal kitchens with stoves, children's play ground at next door Clyde primary	Each cabin has microwave, lighting and TV.	Community-owned campground is the social and sporting centre of Clyde over summer months,		Timber

					school.		indoor and lawn bowls touch rugby, soccer, golf, fishing and boating on Lake Dunstan, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.	
174	Clyde	Clyde Motel	1×Motel	New	Guest laundry equipped with washer and dryer, outdoor BBQ, Sky TV.	9 units all have bathroom with shower, vanity, hair dryer, fully equipped kitchen with oven, microwave and fridge, Telephone, broadband internet, heating and lighting.	Food, wine, OCRT, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, garden and its views, historic sites and buildings, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum,	Assumed timber

							Cromwell Gorge.		
175	Clyde	Clyde's Plum Tree Cottage	1×SC	RB	Fully equipped kitchen, bathroom and toilet, lounge with stove, veranda views of the garden, heat pump, BBQ, TV and stereo.	Both bedrooms with electric blanket and lighting, private courtyard with open air dining area.	Continental breakfast, OCRT, library, plum tree garden, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, garden and its views, historic sites and buildings, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.		Timber
176	Clyde	Cottage Wheatsheaf	1×B&B	RB	A fully equipped kitchen, dining room, lounge, bathroom and a fully fenced private courtyard, wood burner.	Two bedrooms with electric blankets, heating and lighting.	OCRT, surrounding orchards and vineyard, Clutha Bridge, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, garden and its views, historic sites and buildings, ice sports and curling at Naseby, Clyde dam, gold		Schist and concrete, and timber

							mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.		
177	Clyde	Dunstan Hotel	1×Hotel	RB	10 rooms of which 9 have shared bathroom facilities, shared TV lounge with tea and coffee facilities, restaurant, lounge bar, public bar, TAB, gaming machines, pool tables	All bedrooms with heating and lighting.	Food and beverages, breakfast, wine and beer, OCRT, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, garden and its views, historic sites and buildings, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.		Schist stone
178	Clyde	Dunstan House	1×Hotel	RB	6 rooms have shared bathroom, laundry facilities, a separate TV lounge, colonial veranda, central heating, internet facilities – broadband and WiFi.	13 guest rooms, 6 rooms have own ensuite bathroom facilities, tea and coffee making, toaster, fridge and microwave, private courtyard and hill view, one room has self contained kitchen / sitting room, shower and separate toilet.	Packed lunches , OCRT, walking to visit historical and natural heritage, golf, tennis, bowls, vineyards, fishing, kayaking, 4WD, skiing, curling and ice skating (in Alexandra or Naseby).		Stone and timber
179	Clyde	Hartly Arms Backpackers / B&B	1×B&B/1×Bp	RB	Shared shower facilities and toilet, an equipped kitchen.	Bedrooms with heating and lighting.	Continental breakfast, OCRT, Clyde historical		Stacked-stone

							and natural heritage and activities, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, garden and its views, historic sites and buildings, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.		
180	Clyde	Hartley Homestead Boutique B&B	1×B&B	RB	Guest lounge with TV, internet access.	3 rooms each has bathroom, heating and lighting.	Continental breakfast, including our own preserved fresh fruits and jam, hot and cold beverages, wine, OCRT, library, top quality New Zealand made beds, historic city of Clyde, Clutha River, walking,		Mud brick
181	Clyde	Hill view Park B & B and SC	1×B&B/ 1×SC	New	Spa, BBQ, internet broadband.	2 bedrooms with bathroom and toilet with disabled access, heating, lighting.	Continental breakfast, food, OCRT, gardens, landscape views, Clyde historic gold mining heritage, walking, motorcycle or		Timber

							4-wheel drives tours.		
182	Clyde	Kahu Stone Cottage	1×SC	RB	Full kitchen and dining facilities, lounge, log burner, bathroom and separate toilet.	Two bedrooms with lighting.	Food, local wine, OCRT, Clyde city and its attractions, production of electricity via solar panels and batteries, water supply is from a spring running from high in the mountains behind, garden, reading room, fishing, hunting, 4x4 trips, mountain biking, river trips, skiing in the winter, vineyard tours, water skiing and sightseeing.		Stone and timber
183	Clyde	Lavender Drive Bed and Breakfast	1×B&B	New	2 bedrooms with shared bathroom, spa, laundry facilities.	One bedroom with ensuite, all bedrooms with heating and lighting.	Continental breakfast, local and homemade fruits and jams, OCRT, views of Dunstan Mountains, historic heritage of Clyde city, play house and sandpit for children, vineyard, Clyde dam, walks, golf course.		Schist stone and timber
184	Clyde	Mirabell Chalets	1×SC	New	BBQ area, swimming pool, hot tub heated by gas.	3 chalets with ensuite facilities including fully equipped kitchen, bathroom, toilet, laundry facilities and private lounge, heating and lighting.	Continental breakfast, and fresh local eggs, OCRT, historic heritage of Clyde city, four hectares fenced ground for play,		Timber

							feeding hens, adjacent towns and places and their attractions such as Maniototo Plains, St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, garden and its views, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.		
185	Clyde	Olivers of Clyde (lodge and stable)	1×Motel	RB	Dining room, courtyard.	6 of 11 double bedrooms all have en suites with claw-foot baths, 5 of 11 bedrooms have private en suite bathrooms, all bedrooms with heating and lighting.	Breakfast, OCRT, the Clutha river cruises, heritage tour, wine tours, adjacent towns and places and their attractions such as Maniototo Plains , St Bathans, Ranfurly, Alexandra, 9 hole Dunstan golf course, ice sports and curling at Naseby, Clyde dam, gold mining, the Clyde museum, the Herb museum and the Station museum, Cromwell Gorge.		Schist stone
186	Clyde	Picnic Creek Bed & Breakfast	1×B&B	New	Communal lounge, outdoor courtyard.	All three bedrooms have private ensuite, TV, tea and coffee making facilities, individually controlled central heating.	Continental breakfast, OCRT, historic heritage of Clyde city,		Timber

							Clyde dam, landscape and scenery.		
187	Clyde	Postmaster's House	1×B&B	New	2 bedrooms with shared bathroom and toilet, sitting room, cooking facilities.	1 bedroom with ensuite , private lounge, all bedrooms with lighting, heating.	Continental breakfast, OCRT, Clutha river cruises, scenery of the Roxburgh Gorge, historical gold mining towns.		Stone and timber
188	Cromwell	Anderson Park Motels	1×Motel	New	Spa pool, children's playground, guest laundry, hot tub, outdoor living, BBQ.	All 11 ground floor units with ensuite bathroom, equipped kitchen, Sky TV, DVD, broadband, heating and lighting.	Breakfast, OCRT, sports equipment and bikes, Clyde city and its attractions , historic Cromwell Anderson park, Lake Dunstan and Bannockburn for water sports, vineyards and wineries, mountain bike, walking, horse and car racing, skiing.		Timber
189	Cromwell	Carrick Lodge Motel	1×Motel	New	Outdoor sitting.	Four studios all with en-suite bathroom, heated towel rail, hair dryer, Sky TV, kitchen (cooking facilities), broadband and wireless internet, air conditioning and lighting.	OCRT, wineries and vineyards, golf course, biking, goldfield jet thrill, historic heritage and buildings of Cromwell city, policies for being sustainable such as replacing electric bulbs and appliances with low energy environment-friendly bulbs whilst recognizing the need of guests to be able to		Assumed timber

							read under strong light, replacement of shower heads with adjustable jets to provide stronger concentrated flow whilst conserving water, changing shampoo and conditioner bottles to reflect less packaging and far fewer disposals of plastic containers, limitation of irrigation of grounds in the summer by a timer to deliver useful amounts of moisture to grass and gardens without wastage, monitoring of gas and electricity usage to encourage efficiencies in heating, lighting and laundry operations.		
190	Cromwell	Central Gold Motel	1×Motel	New	Fax facilities, BBQ.	All 11 units have kitchen facilities including microwave, jug and toaster, bathroom, hairdryer, electric blankets, heated tile floors, air-conditioning heat pump, telephone, internet, iron and ironing board, lighting. Two units have private outdoor	Breakfast, OCRT, fishing, water-skiing, swimming, boating of all kinds, windsurfing and picnicking, boating, guided fishing trips, Goldfields Jet, wineries and		Stone and timber

						sitting.	vineyards, gold mining heritage, walks, 4WD trips.		
191	Cromwell	Colonial Manor Motel	1×Motel	New	Selection of DVD movies, gas BBQ, recycling collection area.	All units have wireless internet, room heaters and electric blankets, double glazing, bathroom and toilet, equipped kitchen, two units have TV, one unit has DVD player, two upstairs units have own balcony. Each ground floor unit has private outdoor seating area.	OCRT, daily newspaper, vineyards and wineries, golf course, trout and salmon fishing, scenic walks, nature, historic goldfield, sites and trails, water sports on Lakes Dunstan, Hawea, Wanaka and Whakatipu, winter ski fields.		Timber
192	Cromwell	Cromwell Motel	1×Motel	New	Children's playground, outdoor swimming pool, BBQ area.	11 family units with kitchen, bathroom, wireless internet, heating and lighting.	Continental breakfast, OCRT, vineyards and wineries, wine, private gardens, bike hire, walks, Cromwell town, Lake Dunstan, museum.		Timber
193	Cromwell	Cromwell Top 10 Holiday Park(Park Motel 2 rooms and Park Motel 1 room)	2×Motel	New	Laundry room, play ground for kids, internet kiosk with wireless available, BBQ area.	Both park motels have fully equipped kitchen, TV, private bathroom, lounge, heating and lighting.	Food and beverages, wine and beer, OCRT, fishing, swimming, boating, motorcycle hire, skiing and scenic flights, cycling, kayaking, golf, vineyards and wineries, wine, Cromwell town, and its attractions.		Timber
194	Cromwell	Cromwell Top 10 Holiday Park (Self Contained Unit 1 and 2)	2×SC	New	Laundry room, play ground for kids, internet kiosk with wireless available, BBQ area.	Both self contained units have fully equipped kitchen, shower and toilet, lounge, TV, heating and lighting.			Timber
195	Cromwell	Cromwell Top 10 Holiday Park(ensuite units, deluxe units, standard units)	1×SC	New	Communal kitchen, shared bathroom and toilet (communal services for deluxe and standard units), play ground for kids, laundry room,	All units have TV, jug and toaster, heating and lighting. Ensuite units have their own shower and toilet.			Timber

					internet kiosk with wireless available, outdoor BBQ.				
196	Cromwell	Cromwell Top 10 Holiday Park (powered and non-powered sites)	288× powered sites and 183 non-powered sites.	-	Carwash facilities, using communal kitchen and laundry facilities of the close self contained units, play ground for kids, internet kiosk with wireless available, BBQ area.	-			-
197	Cromwell	Golden Gate Lodge	1×B&B	New	Fully equipped guest laundry, gym, restaurant, cafe and bar, fitness centre, wholesale liquor outlet.	All 47 studio units have their own courtyard, coffee and tea making facilities, Sky TV, mini bar, fridge, bathroom and toilet (some units with spa bath), hairdryer, ironing facilities, broadband internet (wireless), telephone, electric blanket, heating and lighting.	Food and beverage, wine and beer, OCRT, equipped conference centre with its own courtyard (used for weddings as well), 42 annual cultural events (listed in table 3), historic Cromwell city, vineyard, wineries, gold field mining centre, golf, jet ski, landscape view, gardens.		Timber and schist rock
198	Cromwell	Dunstan Motel	1×Motel	New	Guest laundry, children's playground, gas BBQ.	All units have fully equipped kitchen, bathroom and toilet, telephone, electric blankets, Sky TV, DVD player, wireless internet.	Continental breakfast, food and beverages, OCRT, DVD library, scenery, tour activities booking service Lake Dunstan, vineyards, orchards, gold mining trails, 4WD, five ski fields, golf course, bowling, squash, swimming, tennis,		Timber

							netball, mountain biking, walking tracks and trail, arts and crafts, Cromwell heated swimming pool, 42 annual cultural events (listed in table3).		
199	Cromwell	Orchard House	1×SC	New	Dining room, laundry facilities, BBQ.	Both suites have ensuite bathroom, balcony, TV and DVD player, heated towel rail, hairdryer, wireless internet, private guest area with coffee and tea making facilities.	Continental breakfast, eggs from the house hens, fresh fruits, wine, OCRT, garden walking tracks, water skiing, Kawarau river jet boating, skiing, fishing, heritage sites, orchard tours, golf tours.		Brick and timber
200	Cromwell	River Rock Estate Vineyard Accommodation	1×B&B	New	Bar, BBQ, heat pump/ air conditioning.	Both units have ensuite bathroom, toilet, tea and coffee making facilities, microwave and fridge, TV, DVD player, wireless internet, hair dryer, lighting.	Breakfast, OCRT, historic Cromwell city, scenery and landscape views, golf course, swimming pool, vineyards, 42 cultural events (listed in table3), wine. This accommodation is not suitable for children under 14 years.		Timber, walls and roof are covered by corrugated iron
201	Queenstown	Four Seasons Motel	1×Motel	New	An outdoor swimming pool, heated spa pool, play area, drying room for skis, a guest computer kiosk, central heating, guest laundry room, BBQ.	All 15 units are equipped with kitchen facilities, bathroom, electric blanket, hair dryer, iron and ironing board, DVD, stereo and Sky TV, WiFi internet.	Continental breakfast, OCRT, DVD Library, Queenstown Bay, skiing, scenery, surrounding national parks.		Concrete

Appendix.6: OCRT- Types of Accommodation services (2011)								
Nu	Location	Accommodation Service	C	Facilities	Cost Single-double/night	Type	Nua	Email
1	Middlemarch	Annandale	6	3 queens rooms	\$90-130	B&B	1	info@annandalebnb.co.nz
2	Middlemarch	Blind Billy's Holiday Camp (3motel units)	13	3 motel units, 3 double and 6 single beds + 1 double sofa bed.	\$115 for two people+ 45 for extra person	Motel	3	info@middlemarch-motels.co.nz
3	Middlemarch	Blind Billy's Holiday Camp (2 studio units)	7	2 studio units, 2 double and 3 single beds.	\$105 for two+ 45 for extra people	SC	2	info@middlemarch-motels.co.nz
4	Middlemarch	Blind Billy's Holiday Camp (7 tourist cabins)	42	7 tourist cabins.	\$35/person	SC	7	info@middlemarch-motels.co.nz
5	Middlemarch	Blind Billy's Holiday Camp (3 backpacker cabins)	18	3 backpacker cabins.	\$22/person excluded bedding	Bp	3	info@middlemarch-motels.co.nz
6	Middlemarch	Blind Billy's Holiday Camp(On-site caravans)	N/A	On-site caravans	\$11 per person (plus \$5 per site if power required).	Caravan/camping	N/A	nfo@middlemarch-motels.co.nz
7	Middlemarch	Blind Billy's Holiday Camp(Caravan, campervan points and tent site)	N/A	Caravan, campervan points & tent sites.	\$11 per person			nfo@middlemarch-motels.co.nz
8	Middlemarch	Cottesbrook	13	Cottage 1- 1 double, 2 queens, 2 singles, 1 double sofa bed. Cottage 2- 2 queen beds, 2 singles.	\$250-300/ cottage/ night	SC	2	www.cottesbrook.co.nz
9	Middlemarch	Gladbrook (B&B)	10	3 queens and two twin bedroom.	\$85-\$210/ room	B&B	1	enquiries @ gladbrook Station.co.nz
10	Middlemarch	Gladbrook(cottage)	5	3 bed room up to 5 guests.	\$60/person – For two nights or more \$180/night / group.	SC	1	enquiries @ gladbrook Station.co.nz
11	Middlemarch	Gladbrook (hut)	5	2 bed rooms.	\$60/person- for two nights or more \$250/night/group.	SC	1	enquiries @ gladbrook Station.co.nz
12	Middlemarch	Jack's Stone Cottage	4	Cottage, 2 bedrooms.	Double \$115, single \$85,	SC		janice.harvie@gmail.com

					each extra person \$40 (whole house \$195)		1	
13	Middlemarch	Middlemarch B&B	7	3 queen rooms, one with an additional single bed.	\$ 80-\$150	B&B	1	equiies@middlemarchbnb.cnz
14	Middlemarch	Pukenangi Country Retreat	8	Renewed farm house(1908), 1 king bedroom, 3 queens bedrooms.	Double rooms (all with ensuite) \$180 - \$240 per night, single occupancy deduct \$20, whole house: \$600	SC	1	enquiries@pukeangihomestead.co.nz
15	Middlemarch	Rose Cottage B&B	6	Cottage studio including two queen rooms, up to 4 guests. Rose bedroom, 1 queen bedroom, up to 2 guests.	Queen suite \$130.00 per night per couple. \$70.00 single, double suite \$120.00 per night per couple. \$70.00 single	B&B	1	inquiries@xtra.co.nz
16	Middlemarch	Strathmore B&B	5	Renewed bakery- 1880- two bedrooms.	\$120 couple, \$80 single	B&B	1	mjwilson@actrix.co.nz
17	Middlemarch	Strath Taieri Hotel	12	Historic hotel (1890), plus B&B (renewed bakery), 2 double bedrooms, 5 single bedrooms, 1 hut (1 double and 1 single).	2 double bedroom \$90 per night, 5 single bedroom \$40 each share twin or \$50 for single room, 'the hut' 1x double, 1 single \$90 per night.	Hotel	1	strathtaierihotel@xtra.co.nz
18	Middlemarch	The Farm Homestay	4	1 king , 1 twin , total 2 bedrooms , can be altered to 4 singles	\$ 75 pppn \$110 -2people in 1,pn	Home stay	1	http://www.thefarmhomestay.co.nz
19	Middlemarch	The Lodge	10	5 rooms lodge, 2 queens, 1 double, 2 x twin rooms.	Queen \$140 double \$100 Single \$50	B&B	1	enquiries@thelodge-middlemarch.co.nz
20	Middlemarch	The Rocks luxury Accommodation (Longford Retreat)	5	2 bedrooms	\$210 for 2 people and \$50 for each additional person	SC	1	info@therocks.co.nz
21	Middlemarch	The Rocks luxury Accommodation (Braeside cottage)	5	1 queen bed an 2 king singles.	\$180 for 2 people and \$50 for each additional person	B&B	1	info@therocks.co.nz

22	Middlemarch	Trails End	6	Two cottages, (each has 1 queens size and 1 king size single bed).	\$140.00 for 2 people (Double) \$30.00 each extra person \$110.00 single rate	SC	2	info@trailsend.co.nz
23	Ngapuna	Off The Trax (built in 1880)	6	2 double and 1 single bedrooms.	\$130 per couple \$200 whole accommodation	SC	1	railtrail2trax@gmail.com
24	Ngapuna	Big Hut (Restored lodge-ski building)	25	Two bunkrooms, a large common room with table tennis table, dining tables and seating, a relatively small kitchen, a gear room and a wash room/entry lobby. There is a tank water supply and an outside toilet, solar lighting is being installed. There is no artificial heating in the hut - it can be subzero in winter.	\$10 per person per night, or \$5 if 12 years or under.	Bp	1	bighut@middlemarch.co.nz
25	Macraes Flat	Stanley's Hotel	16	2 doubles, 2 twin shares and 1 family room with 1 double + bunks, the family unit with a double, 2 singles + fold out couch.	\$65 pppn, \$30 p child (under 12 years old) pn.	Hotel	1	stanleys.hotel@xtra.co.nz
26	Hyde	Otago Central Hotel B&B & Hyde café (B&B)	32	4 double rooms with ensuite, 2doubles with shared facilities and 2 'boutique' suites, one of which boasts a gorgeous claw foot bath.	\$50-\$120 pppn.	B&B	1	info@hydehotel.co.nz
27	Hyde	Otago Central Hotel B&B & Hyde café (camping)	N/A	Camping site with communal showers and toilet.	\$10 per site; showers \$10 per person.	Camping	N/A	info@hydehotel.co.nz

28	Hyde	Emerald Hills Country (guesthouse)	6	3 bed rooms.	\$65/person/night (price includes continental breakfast) queen, twin, super king or 2 single combination.	B&B	1	emeraldhills@clear.net.nz
29	Hyde	Emerald Hills Country (cottage)	6	3 bed rooms.	\$65 pppn	B&B	1	emeraldhills@clear.net.nz
30	Hyde	Pine Grove (1869 historic cottage)	6	3 bed rooms.	\$65/person/night (price includes continental breakfast) double, twin, and super king/2 single combination.	SC	1	matandro@slingshot.co.nz
31	Tiroiti	Tiroiti- Hyde and Tiroiti-Kokonga	-	Historic site for visit (no accommodation).	-	-	-	-
32	Kokonga	Kokonga Lodge	12	6 double bedrooms.	Bed and full breakfast \$285/\$260(double/twin) per room. \$235/\$210 sole occupancy.	B&B	1	info@kokongalodge.co.nz
33	Kokonga	Kokonga Cottage	4	1 double bed room, 1 twin bed room.	\$ 250 for 2 guests, maximum sleeps 4.	SC	1	info@kokongalodge.co.nz
34	Kokonga	2Wheel Backpackers	6	1 private room with queen size bed and 1 bunk with 4 single beds.	Private room \$110 pppn, bunk \$40 pppn	Bp	1	frednewman@xtra.co.nz
35	Pareau/Styx	Styx Hotel	The jail, Styx Hotel – now is a holiday home – and hotel stables are privately owned but the public is welcome to look around.					
36	Patearoa	Patearoa Hotel + 7 Chalets	36	4 twin bed room, up to 22 guests +14 (chalets).	Hotel \$35 per person (ensuite twin bedroom \$37.50 pp), chalet \$25 pp.	Hotel	1	Fax: 03 444 7865 Phone: 03 444 7865
37	Waipiata	Waipiata Country Hotel (built in 1899)	N/A	N/A	From \$70 pppn (includes a hearty continental breakfast).	Hotel	1	enquiries@waipiatahotel.co.nz
38	Waipiata	Komako Peonies & Cottage Garden (the station building)	4	1 queen size and 2 single bed.	\$60 per person including continental breakfast.	B&B	1	enquiries@waipiatahotel.co.nz
39	Waipiata	Komako Peonies & Cottage	2	1 queen size bed accommodation.	\$100 per person			

		Garden (the bank)			including hearty barbecue or roast dinner and continental breakfast.	B&B	1	
40	Waipiata	Komako Peonies & Cottage Garden (the tool shed)	2	Twin bed accommodation.	\$50 per person per night including continental breakfast \$85 per night including hearty barbecue or roast dinner and continental breakfast.	B&B	1	enquiries@waipiatahotel.co.nz
41	Waipiata	Peter's Farm Lodge (the homestead)	12	2 x queen rooms, 1 queen bed, 2 x twin rooms, 2 singles, 1 share room, 4 singles.	\$50 per person per night	Homestead	1	peter@otagorailtrail.co.nz
42	Waipiata	Peter's Farm lodge –3 cabins	6	Sleeps 2 per cabin.	\$50 per person per night	Homestead	1	peter@otagorailtrail.co.nz
43	Waipiata	Tregonning Cottage	6	3 twin bedrooms each with 2 new single beds.	\$50 per person per night	SC	1	peter@otagorailtrail.co.nz
44	Waipiata	Waipiata Cottage	5	2 king and 2 single bedrooms.	\$75 per person	B&B	1	sally.mcdonald@xtra.co.nz
45	Waipiata	Waipiata Motel	12	6 units	\$140 per unit for up to 2 guests.	Motel	1	admin@waipiatamotel.co.nz
46	Ranfurly	Plains Retreat, Ranfurly Hospital	8	3 double bedrooms and one twin.	3-day tour: \$1190 per adult, \$895 per child under 12yrs, 4-day tour: \$1275 per adult, \$955 per child under 12yrs5-day tour: \$1560+ per adult, dependent on itinerary.	Hotel	1	info@offtherails.co.nz
47	Ranfurly	Railway Cottage (1906)	6	1 twin and two double bedrooms.		SC	1	info@offtherails.co.nz
48	Ranfurly	Annerly House	9	1queen bedroom, 1queen plus single bedroom, twin bedroom, twin share bedroom.	\$65 per person, children under 10: \$50 per person	B&B	1	j.hazlett@xtra.co.nz
49	Ranfurly	Hawkdun Lodge	40	13 suites.	\$ 125-\$ 300 adult per night	Motel-style	1	info@hawkdunlodge.co.nz
50	Ranfurly	Moyola Art Deco Guest House	6	3 bedrooms, 2 king bed, 1 twin (king singles)=6 ie 3 doubles or 5 singles	Two options: \$175.00 for 2 people. or, cooked breakfast add \$22 -	SC	1	edna@ruralartdeco.co.nz.

51	Ranfurly	Old Post Office (B&B)	11	1 double (bed) room, 2 twin room (bunk), 1 twin room (bunk), + additional small single bed if required, 1 family room = double bed + bunks.	\$65 / \$50 single occupancy, \$95 for the family room (sleeps up to 4)	B&B	1	oldpobackpackers@gmail.com
52	Ranfurly	Old Post Office (backpackers)	18	Dormitory (two interconnecting rooms of 5 + 4 with 4 sets bunks + 1 single bed).	\$28 per adult,	Bp	1	oldpobackpackers@gmail.com
53	Ranfurly	Ranfurly Holiday Park (motel double studio)	2	1 double bed.	1 bedroom motel \$90 per night for two people.	Motel	1	booking@ranfurlyholidaypark.co.nz
55		Ranfurly Holiday Park(motel studio)	4	Double bed & set of bunks	Rates for two people \$90 per night, extra adults \$20 each, extra children \$15 each.	Motel	1	booking@ranfurlyholidaypark.co.nz
55	Ranfurly	Ranfurly Holiday Park (motel studio)	5	Double bed set of bunks & single bed.	Rates for two people \$90 per night, extra adults \$20 each, extra children \$15 each.	Motel	1	booking@ranfurlyholidaypark.co.nz
56	Ranfurly	Ranfurly Holiday Park (1 bedroom motel unit)	6	Queen size bed lounge including set of bunks and a double pull out divan bed.	Price from: \$100.00 per night	Motel	1	booking@ranfurlyholidaypark.co.nz
57	Ranfurly	Ranfurly Holiday Park (double cabin)	2	Bunk bed with double on the bottom .	Cabin \$40 per night for two people maximum 8 people, extra adults \$15, extra children \$12.	SC	1	booking@ranfurlyholidaypark.co.nz
58	Ranfurly	Ranfurly Holiday Park(cabin - sleeps 4)	4	Two sets of single bunks.	Rates for two people \$40 per night, extra adults \$15 each, extra children \$12 each.	SC	1	booking@ranfurlyholidaypark.co.nz
59	Ranfurly	Ranfurly Holiday Park(cabin - sleeps 5)	5	Double bunk (double bed below and single bed on top) and a set of single bunks.	Rates for two people \$40 per night, extra adults \$15 each, extra children \$12 each.	SC	1	booking@ranfurlyholidaypark.co.nz
60	Ranfurly	Ranfurly Holiday Park – two bedroom cabin(sleeps 8)	8	2 rooms, 2 sets of single bunks in each room.	Rates for two people \$40 per night, extra adults	SC	1	booking@ranfurlyholidaypark.co.nz

					\$15 each, extra children \$12 each.			
61	Ranfurly	Ranfurly Holiday Park (powered sites-8 person)	8	Camp site	\$28 per night for two people, extra adults \$12, extra children \$8.	Camping	1	booking@ranfurlyholidaypark.co.nz
62	Ranfurly	Ranfurly Holiday Park (non-powered sites -8 person)	8	Camp site	\$12 per adult, \$8 per child.	Camping	1	booking@ranfurlyholidaypark.co.nz
63	Ranfurly	Ranfurly Motel	16	2 studio units (one with a queen, the other a super king), ensuite, up to 4 guests, 4family or group units with 2 bedrooms (3 with two singles in each bedroom and queen in the lounge, the 4th has a queen in the bedroom and two singles.	Studio 1-2 people - \$100, 2 bedroom units 2 people - \$115.	Motel	1	ranfurlymotels@xtra.co.nz
64	Ranfurly	Ranfurly Lion Hotel	30	Twin and single rooms.	From \$50 single to \$85 double room	Hotel	1	Ranfurly.hotel@xtra.co.nz
65	Ranfurly	Trail Blazers B&B (and farm adventures)	8	3 queen bedrooms and 1 twin bedroom.	\$55 per person (including continental breakfast).	B&B	1	Trail_blazers@live.com
66	Ranfurly	Trout 'n' Trail B&B	8	1 queen and 1king studio.	Queen studio (two people) \$110,queen studio (single occupancy)-\$60, king studio (two people)\$110 , king studio, extra adult \$40, king studio family rate (2 adults, 2 children double sofa) \$165.	B&B	1	booking@troutntrailbnb.co.nz
67	Wedderburn	Mt Ida Station Farm stay	5	3 bedrooms.	N/A	SC	1	mt.ida@farmside.co.nz
68	Wedderburn	Wedderburn Lodge and Cottages (lodge)	9	Lodg-1 double bedroom 1 bedroom with 1 double + 2 singles 1 bedroom with 3 singles.	\$50.00 per person, children under 10 half adult price.	SC	1	enquiries@wedderburn.net.nz
69	Wedderburn	Wedderburn Lodge and Cottages (1 large cottage and 2 small	8	1 large cottages, bedroom with 2 singles1 loungette with 1 king	\$75.00 per person	SC	1	ienquiries@wedderburn.net.nz

		cottages)		single, up to 4, 2smaller cottages, each has 2 singles or 1 super king ensuite, up to 4 guests.				
70	Wedderburn	Wedderburn Tavern (mud brick bunkhouse)	6	1 double bed and two sets of bunks.	\$ 45- \$50 per person	B&B	1	info@wedderburntavern.co.nz
71	Wedderburn	Wedderburn Tavern (tavern)	14	Tavern, two sets of bunks, 3 bed rooms, 1 family room up to 14 guests	\$50-\$110	SC	1	info@wedderburntavern.co.nz
72	Wedderburn	Wedderburn Tavern (tent and camp)	12	1 tent sleeps 6 and 1 campsite.	N/A	Camping	1	info@wedderburntavern.co.nz
73	Danseys Pass	Danseys Pass Hotel	6	1 ensuite double twin and 2 double twins.	Ensuite double/twin \$160, double twin \$140	Hotel	1	booking@danseyspass.co.nz
74	Danseys Pass	Short Lands Station Farm Stay	6	Double storey homestead 3 double rooms convert to twin or single..	Single \$60, double \$110	B&B	1	shortlands@scorch.co.nz
75	Naseby	Ancient Briton Hotel	40	Historical 16 rooms hotel 3 double bedroom with ensuite, 4 double & one single bedroom with ensuite ,1twin bedroom with bunk set and ensuite ,2triple single bedroom with ensuite), 1single bedroom [not ensuite),1 bunk room [not ensuite] connects to family room ,1 studio unit with twin beds and ensuite, some cooking facilities ,1 family unit with double bed, single bed, and ensuite, day bed in living area and cooking facilities .	\$105 for twin share \$75 for single room.	Hotel	1	ancientbriton@xtra.co.nz
76	Naseby	Larchview Holiday Park (tourist flat)	9	3 separate bedrooms.	\$81per 1 and 2 persons.	SC	1	bookings@larchviewholidaypark.co.nz
77	Naseby	Larchview Holiday Park (miners cottage) ¹	6	2 separate bedrooms with log burner, heater, fully equipped kitchen, shower and toilet.	\$81per 1 and 2 persons-	SC	2	bookings@larchviewholidaypark.co.nz

78	Naseby	Larchview Holiday Park (10 chalets)	40	Each of 10 chalets has double bed and bunks, heater, jug, toaster, crockery, occupants supply utensils, linen etc.	\$45 per person- \$ 49 per 2 persons	SC	10	bookings@larchviewholidaypark.co.nz
79	Naseby	Larchview Holiday Park (3 cabins)	12	3 cabins	\$40 per person- \$ 45 per 2 persons	B&B	3	bookings@larchviewholidaypark.co.nz
80	Naseby	Larchview Holiday Park (48 powered sites)	288	48 Powered site, assumed each sites up to 6 guests).	\$14 per person- \$ 28 per 2 persons	camping	48	bookings@larchviewholidaypark.co.nz
81	Naseby	Larchview Holiday Park (24 non-powered sites)	144	24 Non-powered site(tent sites, assumed each sites up to 6 guests).	\$13 per person- \$ 26 per 2 persons	Camping	24	bookings@larchviewholidaypark.co.nz
82	Naseby	Mountain View (cottage)	8	2 bedrooms.	\$150 per night for two people	SC	1	eileenherd@xtra.co.nz
83	Naseby	Mountain View (2 ensuite units)	5	2 queen bedrooms and 1 single bedroom.	\$105 per night for two people	B&B	1	eileenherd@xtra.co.nz
84	Naseby	Mountain View (tourist flat)	6	1 ensuite bedroom with 3single beds and a bed sitter providing a double bed and pull out sofa.	\$125 per night for two people	B&B	1	eileenherd@xtra.co.nz
85	Naseby	Mountain View (the house with 3 bed rooms)	6	The House, 3 bedroom, a queen and two kings.	\$160 per night for two people.	SC	1	eileenherd@xtra.co.nz
86	Naseby	Naseby Trail Lodge (6 one bedroom units)	12	6 one bedroom units.2 two bedrooms units.	1 bedroom unit \$160 (1 or 2 people.	SC	1	stay@nasebylodge.co.nz
87	Naseby	Naseby Trail Lodge (2 two bedroom units)	8	2 two bedrooms units.	2 bedrooms unit \$250 (1 to 4 adults).	SC	1	stay@nasebylodge.co.nz
88	Naseby	Old Doctor's Residence	5	1 super king room, 1 super king bedroom, 1 sofa/queen.	\$245- pn \$295 per suit	B&B	1	info@olddoctorsresidence.co.nz
89	Naseby	Royal Hotel (hotel)	18	3 twin rooms, 1 king size bedroom, 3 double bedrooms.	\$89-\$115 pppn	Hotel	1	(03) 444 9990
90	Naseby	Royal Hotel (self contained)	4	2 bedrooms self contained cottage.	\$180/night for two minimum.	SC	1	(03) 444 9990
91	Oturehua	Crowsnest Accommodation (bunkrooms/lodge)	12	2storey backpacker lodge with 12 bunks.	With bedding included \$40 per adult and \$30 for children under 12 years old, with your own bedding (sleeping bags)	BP	1	crowsnestnz@gmail.com

					\$30 per adult and \$20 for children under 12 years old.			
92	Oturehua	Crowsnest Accommodation (2 cabins)	4	1 double bed.	\$110 for up to two people	SC	2	crowsnestnz@gmail.com
93	Oturehua	Crowsnest Accommodation (the Bach).	3	1 double and single bed.	\$110 for up to two people	SC	1	crowsnestnz@gmail.com
94	Oturehua	Crowsnest Accommodation (tent sites and powered sites)	6	1 powered site for a caravan or campervan.	\$15 per person	Camping	1	crowsnestnz@gmail.com
95	Oturehua	Hawk Rock Cottage	6	3 double bedrooms.	\$65 - \$75 per person. (minimum 4 cyclists), 2 nights or more \$160 per couple per night	B&B	1	info@hawkrockcottage.co.nz
96	Oturehua	Hill Creek Hideaway	4	1 twin Room, 1 double Room	Tariff NA	B&B	1	Mobile phone: 021 1314267
97	Oturehua	Inver Lair lodge	16	6 rooms.	\$75pp	B&B	1	rj.rjduffy@xtra.co.nz
98	Oturehua	Oturehua Lodge & Cottage (1 Queen, twin rooms cottage)	6	1 Queen, 2 twin rooms.	Queen- \$150pppn, twin \$130 pppn	B&B	1	oturehualodge@xtra.co.nz
99	Oturehua	Oturehua Lodge & Cottage (1 x 2 bedroom cottage)	4	2 bedroom cottage.	\$260 pn	SC	1	oturehualodge@xtra.co.nz
100	Oturehua	Oturehua Lodge & Cottage (2 studio cottage)	4	2 studios	\$150 pn	SC	2	oturehualodge@xtra.co.nz
101	Oturehua	Oturehua Tavern and Self Contained (built in 1899)	4	2 bedrooms with 4 single beds.	\$ 45 pppn (including continental breakfast)	SC	1	oturehuatavern@xtra.co.nz
102	Oturehua	The Mill B&B	4	2 queen and twin rooms.	\$145 double; \$85 single (inclusive of full country breakfast)	B&B	1	dunmore7@xtra.co.nz
103	Oturehua	The Old Shop B&B	6	1e double room, 1 large bedroom with four single beds.	2 persons \$60.00 per head, 3 to 6 persons \$55.00 per head.	B&B	1	ewart.rhonda@scorch.co.nz
104	St Bathans	Cambrian Station	5	1 queen, 2 singles, 1 sofa bed.	\$130.00 per night for up to 2 guests \$150.00 per night for up to 4 guests \$20.00 each extra person	SC	1	stay@cambrianstation.co.nz

					thereafter.			
105	St Bathans	Constable Cottage & Goal (cottage)	6	3 bedrooms .	\$ 220 pnp couple	SC	1	info@stbathansnz.co.nz
106	St Bathans	Constable Cottage & goal(goal)	2	The Jail (Gaol): 1 queen size bed.	\$125 pnp couple	SC	1	info@stbathansnz.co.nz
107	St Bathans	Lombardy Cottage (cottage)	4	1 king and 1 queen bedroom.	\$250 a night for the cottage - 2 night minimum for the first couple then \$50 per person after	SC	1	www.lombardycottage.co.nz
108	St Bathans	Lombardy Cottage (caravan)	4	2 singles and a double berth, with an additional queen bed in the awning if required	NA	SC	1	www.lombardycottage.co.nz
109	St Bathans	St Bathans B&B	5	2 king size single beds, 1 queen room and 1 family room.	Single \$80- Double \$ 130, family room: \$50 per guest	B&B	1	enquiries@stbathansbnb.co.nz
110	St Bathans	Vulcan Hotel (built in 1882)	8	.2 double and 2 twin bed rooms.	2 double rooms at \$45 pp. 2 Twin at \$35 pp.	Hotel	1	stbathans.vulcanhotel@scorch.co.nz
111	Ida Valley	Parkside Farm Stay	9	1 Queen Room 1 Twin Bedroom 1 Double Bedroom sleep-out with a double and single bed. Up to 9 guests.	Web site is NA	B&B	1	jdkewhyte@xtra.co.nz
112	Auripo	Poolburn Hotel	16	8 rooms.	\$50 a double room with breakfast	Hotel	1	dmshearing@xtra.co.nz
113	Auripo	Taradale Homestead (built in 1880)	6	2 large queen size and 2 single bed rooms.	\$90-\$110 per night	Homestead	1	davitook@xtra.co.nz
114	Becks	White Horse Hotel(1864)	18	7 room	Room rates start from \$40.00 single and includes a continental breakfast.	Hotel	1	becks_hotel@hotmail.com
115	Lauder	Big Sky Cottage	4	2 bedrooms.	\$135 for 2 people per night, \$174 for 3 people per night, \$195 for 4 people per night.	SC	1	enquiries@bigskycottage.co.nz

116	Lauder	Lauder Rail Trail School and Milmor Cottage (3 school ensuite rooms)	6	3 school ensuite rooms.	\$80 per person	B&B	1	lauderschool@xtra.co.nz
117	Lauder	Lauder Rail Trail School and Milmor Cottage (studio cottages)	N/A	2 cottage studios.	\$80 per person	SC	1	auderschool@xtra.co.nz
118	Lauder	Lauder Rail Trail School and Milmor Cottage (standard rooms)	6	1 queen room, 1 twin Room, 1 double room.	\$60 per person	SC	1	auderschool@xtra.co.nz
119	Lauder	Lauder Rail Trail School and Milmor Cottage (cabin)	2	1queen/twin room.	\$60 per person	SC	1	auderschool@xtra.co.nz
120	Lauder	Lauder Rail Trail School and Milmor Cottage (Milmor cottage)	8	1 double, 2 twin , 2 more singles available.	\$60 per person	SC	1	auderschool@xtra.co.nz
121	Lauder	Lauder Store B&B (the old store)	4	1 double bed, 2 single beds.	\$135 per night-2 people \$220- 3 people \$260- 4 people \$300.	SC	1	info@lauderstore.co.nz
122	Lauder	Lauder Store B&B (Storekeeper house)	8	2 queens, 1 twin and 1 bunk rooms	\$60-\$135 per night	SC	1	info@lauderstore.co.nz
123	Lauder	Lauder Store B&B (Arkwrights Snug)	4	1ensuite, 1super king/zipped.	\$90-\$150 per night	SC	1	info@lauderstore.co.nz
124	Lauder	Lauder Hotel	14	7 rooms.	\$55 per person per night including continental breakfast.	Hotel	1	gerald@lauderhotel.co.nz
125	Lauder	Lauder Burn House B&B	8	4 bedrooms.	\$75-\$ 100 single \$150-\$160 couple	B&B	1	lauderburn@farmside.co.nz
126	Lauder	Lauderdale Estate(built in 1921- cottages)	6	3 bed rooms.	\$75-\$ 100 single \$150-\$160 couple	B&B	1	info@lauderdaleestate.co.nz
127	Lauder	Muddy Creek (built in 1930)	10	5 bedrooms.	\$70 pppn, children (2-11years) \$30 pppn.	SC	1	enquiries@muddycreekcutting.co.nz
128	Lauder	Pedal Inn	6	2 suits include 6 single beds.	\$80 pppn, trundle bed \$50 pppn	SC	1	benandcatherine@farmside.co.nz

129	Moa Creek	Bonspiel Station & Old Moa Creek hotel	6	2 studio six beds.	N/A. Advertised as (negotiable).	Hotel	1	ben.falconer@farmside.co.nz
130	Poolburn	Poolburn Hotel	12	Stacked stone huts built by Chinese gold miners in the 1860s. No electricity no running water. 4 rooms up to 12 plus sleep out.	\$50 a double room with breakfast	Hotel	1	dmshearing@xtra.co.nz
131	Poolburn	Solandra Lodge country style B&B(built in 1930)	8	8 bedrooms.	1 to 2 adults = \$150 per night, additional adults up to total of 6 = \$50 pppn.	B&B	1	bookings@solandralodge.co.nz
132	Ophir	Blacks Hotel	20	10 double rooms.	\$60 per person (includes continental breakfast)	Hotel	1	steven.chapman@clear.net.nz
133	Ophir	Flannery Lodge	10	2 double room, four or five to a room Flash packer style.	2 double room, \$125 per room, room flash packer style, \$ 40 per person.	B&B	1	flannerys@scorch.co.nz
134	Ophir	Flannery Lodge (tent site)	25	Tent Sites	N/A (\$5 for BBQ)	Camping	10	flannerys@scorch.co.nz
135	Ophir	Millfield Cottage	6	3 bedrooms.	Peak (Nov-Apr): \$60pppn for 2 adults, \$50 per additional adult, peak-off, \$50 pppn, children \$40 pppn.	SC	1	Bm.waller@xnet.co.nz
136	Ophir	Ophir Bridge B&B	4	2 bedrooms.	\$200 per night when 1 room booked (total use of B & B), \$180 per room per night when 2 rooms booked (shared bathroom), \$150 per night single rate.	B&B	1	http://www.ophirbridgebandb.co.nz/index.html
137	Ophir	The Old Bakery (built in 1880-Stables building)	4	1 double and 1queen bedroom.	\$65 per person, \$100 for two guests.	B&B	1	lauderschool@xtra.co.nz
138	Ophir	The Old Bakery (built in 1880-Bakery)	3	1 queen and 1 single bed.	\$50 per person	B&B	1	lauderschool@xtra.co.nz
139	Omakau	Church Hill B&B	6	1 queen and 1 twin room.	1 queen with ensuite – Single \$110 Double \$140,1 twin Room,	B&B	1	Church_hill-bandb@xtra.co.nz

					shared facilities – Single \$60 Double \$120			
140	Omakau	Hawksview B&B (built in the 1930)	6	1 king-twin and 2 queen bedrooms, up to six singles.	\$ 140 for 2 guest pn, \$50 for additional children pppn.	B&B	1	Hawksview@xtra.co.nz
141	Omakau	Killarney Cottage (built in 1928)	6	1 queen bed, 1 double single.	\$55 per person	SC	1	tigerhillodge@hotmail.com
142	Omakau	Omakau Accommodation Cottage & Ensuite Studio Units (units)	16	5 ensuite studio units including: 5 queens and 6 single rooms. Up to 16 guests	Units: from \$140.00 (1 or 2 people) extra \$45.00 per person	SC	1	mandy@omakau-accommodation.co.nz
143	Omakau	Omakau Accommodation Cottage & Ensuite Studio Units (cottage)	7	3 bedrooms.	1 bed room \$180.00 2 bed rooms \$260.00 3 bedrooms \$300.00	SC	1	mandy@omakau-accommodation.co.nz
144	Omakau	Omaka bed post (Post Master's House & Post Office-Post Master's House)	6	1 queen and 2 twins.	\$70 pppn	B&B	1	omakaubedpost@gmail.com
145	Omakau	Omaka Bed Post (Post Master's House & post office-post office)	6	2 queens and 1 bunkroom.	\$70 pppn	B&B	1	omakaubedpost@gmail.com
146	Omakau	Omakau Commercial Hotel	22	4 queens/twins with ensuite, 5 rooms with shared male and female bathrooms, 4-berth bunk room.	Single (shared bathroom) from \$45 Queen bed rooms from \$80	Hotel	1	omakaucommercial@xtra.co.nz
147	Omakau	Peddl'n Away B&B	7	2 double bedrooms and 1 bedroom with 3 single beds.	\$45 per person	B&B	1	Elaine_iain@paradise.net.nz
148	Omakau	Tiger Hill Lodge and Wilson's (Tiger Hill Lodge)	8	2 double and 3 single bedrooms.	\$75 per person per night (includes continental breakfast)	SC	1	tigerhillodge@hotmail.com
149	Omakau	Tiger Hill Lodge and Wilson's (Wilson's)	6	3 bed rooms.	\$70 per person per night (includes continental breakfast).	SC	1	tigerhillodge@hotmail.com
150	Chatto Creek	Chatto Creek Tavern Budget Accommodation	6	2 storey lodge.	Backpacker \$30 per night, room \$70 per night.	Bp	1	Nikki.puf@xtra.co.nz

151	Chatto Creek	The Magdelans B&B	24	4 bedrooms- 4 superbly ensuited-4 super king size beds.		B&B	1	dgandbw@homail.com
152	Chatto Creek	Rockdale B&B	6	2 double room- 1 bunk room.	\$70 per person per night (includes continental breakfast), \$60 per person per night for groups of 5 or more (includes continental breakfast).	B&B	1	Rockdale.farm@xtra.co.nz
153	Alexander	Avenue Motel	26	13 units.	\$125-\$145pppn	Motel	1	Avenue.motel@xtra.co.nz
154	Alexander	Alexander's Riverview B&B	6	2 queen bedrooms up to 6	\$150 per bedroom or 3 bedroom \$390 (6 guests \$65 per person)	B&B	1	jj-instone@clear.net.nz
155	Alexander	Alexandra Garden Court Motel	30	6 fully self contained units.	\$85-\$115 per (1-2 person).	Motel	1	alex.gardencourt@xtra.co.nz
156	Alexander	Alexandra Heights Motel	44	4 two bedrooms (queen & twin), 3 studio apartments with spa bath (queen & single), 3 studio units (queen & single), up to 34 guests + 10 extra person.	\$120-\$140 two adults, \$20 extra person.	Motel	1	alexandraheightsmotel@xtra.co.nz
157	Alexandra	All Seasons Tourists Flats	2	1 queen size bedroom.	\$70 single - \$90 double pppn	SC	1	allseasons.tf@clear.net.nz
158	Alexander	Alexandra Almond Court Motel	48	8 self contained units.	\$115.00 - \$140.00 and \$20.00 extra	Motel	1	info@almondcourtmotel.co.nz
159	Alexander	Central Court Motor Inn	66	33 units including studios and 1 & 2 bedroom suites.	\$70-\$149 pppn	Motel	1	www.centennialcourt.co.n
160	Alexandra	Criterion Club Hotel (Bp-downstairs)	7	1 bunk with 7 beds.	\$25 per person (linen provided), \$20 per person (own bedding)	Bp	1	middle.pub@xtra.co.nz
161	Alexandra	Criterion Club Hotel (Bp-upstairs)	22	11 guest rooms.	\$50 to \$60 per person \$80 – \$90 two persons	Bp	1	middle.pub@xtra.co.nz
162	Alexandra	Hawkdun Rise Vineyard Homestay	6	2 queen size bedrooms. a double bedroom.	\$180-\$235 pn.	B&B	1	hillviewpark@xtra.co.nz

163	Alexandra	Hillview Park B&B	6	1 queen, two super singles and pull-out sofa (double).	\$90 single \$110 double	SC	1	marg@loghouseretreat.co.nz
164	Alexandra	Log House Retreat	6	3 queen size bedrooms.	\$220-\$265 pppn	B&B	1	marg@loghouseretreat.co.nz
165	Alexandra	Marj's Place (Home stay)	5	1 double bedroom and 1 three bedded room.	\$70.00 double - \$35.00 single	SC	1	http://www.quailrock.co.nz/index.html
166	Alexandra	Marj's Place (Backpacker)	18	3 separate units with 18 beds.	\$25 pn	Bp	1	http://www.quailrock.co.nz/index.html
167	Alexandra	Quail rock B&B	4	1 master bedroom with ensuite, 1 king/twin bedroom.	\$100-\$150 pn	B&B	1	info@speargrassinn.co.nz
168	Alexandra	Speargrass Inn	6	3 units include 3 queen size beds.	\$155-\$170 (1-2 people).	SC	1	info@theworkshopsclvde.co.nz
169	Clyde	Absolutely Amazing Workshops B&B	10	4 bedrooms.	Beds \$50 per person, single occupancy of Queen \$75	B&B	1	info@theworkshopsclvde.co.nz
170	Clyde	Antique Lodge Motel	24	7 units- 6 of 7 having two bedrooms (double bed/2 or 3 single).	Single from NZ\$95 Double from NZ\$105	Motel	1	stay@antiquelodgemotel.co.nz
171	Clyde	Argyll on Clyde bed & Breakfast	6	2 queen bedrooms and 1 twin bedrooms.	\$120 - \$180 per room	B&B	1	argyllonclyde@yahoo.co.nz
172	Clyde	Bed and Breakfast @Clyde	8	2 queen rooms, 1 ensuite, and 1 twin bedroom.	\$100-\$140 pn	B&B	1	info@bedandbreakfastatclyde.co.nz
173	Clyde	Clyde Holiday & Sporting Complex	28	8 cabins – for 3 and four people.	\$40 for 2 adults. \$12 each extra adult	SC	1	crrc@ihug.co.nz
174	Clyde	Clyde Motel	N/A	2 bedroom units and one bedroom units. 9 one bedroom and 2 bedrooms units.	Units from \$95 to \$140	Motel	1	clyde.motels@xtra.co.nz
175	Clyde	Clyde's Plum Tree Cottage	4	2 bedrooms.	\$140.00 a night for two people & \$20.00 each additional person	SC	1	cmgrieve@farmside.co.nz
176	Clyde	Cottage Wheatsheaf (built over 100 years ago).	4	2 bedrooms (1 queen and 1 two singles).	\$130 a night for two people; \$25 each additional person	B&B	1	pip.mark.wellstead@xtra.co.nz
177	Clyde	Dunstan Hotel (built in 1940).	17	10 rooms including: 3 single rooms, 3 twin rooms, 3 double rooms, 1 double room with ensuite.	Single \$ 45- double \$80	Hotel	1	tonokajo@xtra.co.nz
178	Clyde	Dunstan House (built in 1900)	29	13 bedrooms.	\$120- \$220	Hotel	1	davidson@dunstanhouse.co.nz
179	Clyde	Hartly Arms Backpackers / B&B	8	1 double room and two bedrooms	NZ\$40 per night	B&B-	1	hartlyarms@xtra.co.nz

				with four beds in each.		Bp	B&B-1 Bp	
180	Clyde	Hartley Homestead Boutique B&B	6	3 bedrooms.	\$150-\$220 pn	B&B	1	info@hartlyhomestead.co.nz
181	Clyde	Hill view Park B & B and SC	6	2- bedrooms.	\$90 single \$110 double	B&B/ SC	1B&B-1SC	hillviewpark@xtra.co.nz
182	Clyde	Kahu Stone Cottage (built in 1865).	4	1 super king and 1 queen bed rooms.	1 night stay \$350 2 nights stay \$600	SC	1	stay@kahuvalley.co.nz
183	Clyde	Lavender Drive Bed and Breakfast	6	1 king room with ensuite, 2 queen bedrooms.	\$140-\$160 pn	B&B	1	lavenderdrivebandb@yahoo.co.nz
184	Clyde	Mirabell Chalets	13	3 chalets.	\$115 -\$125 two adults	SC	1	andy.family@xtra.co.nz
185	Clyde	Olivers of Clyde (lodge and stable- Built in 1860).	22	11 double bedrooms.	1-2 guests: \$185-\$315 family suit: 1-4 guests \$385-\$405	Motel	1	enquiries@oliverscentralotago.co.nz
186	Clyde	Picnic Creek Bed & Breakfast	6	3 bedrooms.	\$180 per room	B&B	1	wendy.picniccreek@xtra.co.nz
187	Clyde	Postmaster's House	6	3 bedrooms.	\$95 room rate for queen and twin, \$125 room rate for queen ensuite.	B&B	1	postofficecafeclayde@xtra.co.nz
188	Cromwell	Anderson Park Motels	36	11 ground floor SC units.	\$95 - \$110 (1-2 person), \$15 extra person.	Motel	1	0800220550
189	Cromwell	Carrick Lodge Motel	16	4 studio- 1 bedroom family unit.	\$ 96- \$156 pppn.	Motel	1	carricklodge@xtra.co.nz
190	Cromwell	Central Gold Motel	57	11 mainly ground floor units, (each unit up to 2-5 guests), plus 1 private executive suite with super king size.	\$110-\$160 (1-2 persons).	Motel	1	info@centralgoldmotel.co.nz
191	Cromwell	Colonial Manor Motel	14	1 upstairs studio, 1studio, 1 deluxe studio, 1 executive/spa unit and 1family unit.	\$ 115-\$165 pppn family unit, from \$180 for 4 people.	Motel	1	
192	Cromwell	Cromwell Motel	42	11 spacious ground floor units.	\$75 to \$130 for 1-2 persons.	Motel	1	info@cromwellmotel.co.nz
193	Cromwell	Cromwell Top 10 Holiday Park(park motel 2 rooms and park motel 1 room)	36	8 park motels.	\$130 motel1-\$145 motel 2 per unit.	Motel	8	Tel: +64 (3) 445 0164

194	Cromwell	Cromwell Top 10 Holiday Park (Self Contained Unit 1 and 2)	5	3units	\$110 unit 1, \$130 unit 2.	SC	2	Tel: +64 (3) 445 0164
195	Cromwell	Cromwell Top 10 Holiday Park(ensuite units, deluxe units, standard units)	6	2 ensuite units.	\$98 en-suit unit-\$80 deluxe.	SC	2	Tel: +64 (3) 445 0164
196	Cromwell	Cromwell Top 10 Holiday Park(powered and non-powered sites)	282 6	Powered site (288) - non-powered site (183)	Price per unit/site= \$38	Camping	471	Tel: +64 (3) 445 0164
197	Cromwell	Golden Gate Lodge	96	47 bedrooms rooms, a mix of twin, double and triple studio units, two luxury suites, two interconnecting units, three units for disabled guests.	Single from NZ\$125, double/Twin from NZ\$125.	B&B	1	stay@goldengate.co.nz
198	Cromwell	Lake Dunstan Motel	28	15 modern, spacious units.	\$120 pppn	Motel	1	info@lakedunstanmotel.co.nz
199	Cromwell	Orchard House	4	2 king suites.	single \$230 Double \$250 , tariffs include breakfast.	SC	1	booking@orchardhouse.co.nz
200	Cromwell	River Rock Estate Vineyard Accommodation	4	2 kings double unite.	1-2 adult \$155 pn	B&B	1	info@riverrockestate.com
201	Queenstown	Four season Motel	53	4 one-bedroom units, up to 16 guests, 1 family unit up to six guests, nine studios unites up to 27 guests, directors suit, up to 4 guests.	\$125-\$190 pppn	Motel	1	stay@queenstownmotel.com

Appendix.7: OCRT Cultural Products and Activities (2011)

Local produce

No.		F	No.		F	No.		F	No.		F
1	Continental Breakfast.	80	5	Home baking and local food.	20	9	Beer.	30	13	Crafts.	1
2	Country style cooked breakfast.	6	6	Local vegetables.	8	10	Non-alcoholic drinks.	5	-	-	-
3	Irish breakfast.	1	7	Fruit.	9	11	Grazing for those doing OCRT on horseback.	8	-	-	-
4	Homemade preserves and jams.	3	8	Wine.	62	12	Art works for sale.	1	-	-	-

General produce											
1	Food and beverages	72	2	Packed food.	3	3	BBQ packed lunch.	1	4	New Zealand made beds.	1
Services											
1	Tour activities booking centre.	1	4	Car and coach hire.	1	7	Golf clubs (hire/sale).	3	10	Fishing rods (hire/sale).	2
2	Local transportation.	20	5	Motorcycles hire.	1	8	Kayak (free/hire).	2	11	Tennis racquets and balls.	1
3	CD, DVD, type, movies (free/hire).	9	6	Bike hire.	8	9	Sport equipment (undefined-hire/sale).	3	12	Gold pan (hire/sale).	2
Visits											
1	Middlemarch.	15	22	Dunstan Lake	4	43	Roxburgh Gore scenery.	1	64	Gold progress mine (heritage).	1
2	Kakanui.	1	23	Bannockburn Lake	1	44	Taieri Gorge Railway.	5	65	Chinese miner's hut.	1
3	Hawkdun.	2	24	Manuherikia river	6	45	Tour of the nearby Oceania Gold-Open-Cast mine at Macraes.	3	66	The historic Doctor point Gold Digging s Clutha river.	1
4	Ida valley.	1	25	Taieri river	4	46	Tour of Bare Wood Station.	1	67	Historic artefacts	1
5	Omakau.	5	26	Daniel O'Connell bridge.	4	47	Rural Art Deco tour of Ranfurly.	1	68	Aquatic centre.	1
6	Ophir.	7	27	Iconic steal lattice bridge.	1	48	TONI's TIKI tour.	1	69	Smooth Cone Hill	2
7	Ranfurly (rural Art Deco town)	23	28	Clutha bridge.	1	49	The Best Bits tour.	2	70	Drybread	1
8	Matakanui (town to gold mining heritage).	2	29	Shaky bridge	1	50	Wineries.	34	71	Manitoto Plains	8
9	Cambrian (town to gold mining heritage).	2	30	Museum (undefined).	5	51	Garden (private/surrounding).	41	72	Queenstown bay.	1
10	Alexandra.	11	31	Art Deco museum.	1	52	Beer garden.	3	73	Gold mining heritage	25
11	Clyde.	9	32	Railway station museum.	9	53	World class garden.	1	74	Dunstan Range.	2
12	Naseby.	16	33	Ballarat Cottage art museum.	1	54	Naseby town garden.	1	75	Rough Ridge Ranges	1
13	Waipiata	2	34	The Clyde museum.	8	55	Queenstown National park	1	76	Rock and Pillar Range	9
14	Macraes Flat gold mining town	2	35	Central stories museum and art gallery.	1	56	Oteake conservation park	3	77	Art, Sculpture& Gardens (art studio).	1
15	Historic Wedderburn village.	4	36	The Herb museum.	7	57	Cromwell's Anderson park.	1	78	Exploring painters and photographers paradise.	3
16	Historic St Bathans village.	22	37	Oturehua museum.	1	58	Private farm.	11	79	Art room.	1
17	Oturehua village.	3	38	Early settlers' museum.	1	59	Historical sites and buildings (undefined).	85	80	Watch farming demonstration.	3
18	Matakanui river.	1	39	Ranfurly's own Art Deco gallery.	1	60	The old Golden Point mine in Deepdell Creek.	1	81	Poolburn dam	3
19	Clutha river.	4	40	Poolburn Gorge.	1	61	Historic Hamilton's goldfields	4	82	Clyde dam.	10

							cemetery.				
20	Sutton Salt Lake.	9	41	Thompsons Gorge.	1	62	The old Waipiata Sanatorium.	3	83	Scenery.	72
21	Blue Lake.	3	42	Cromwell Gorge.	14	63	Historic Hayes Engineering.	7			
Events											
1	Local annual events/festivals.	22	2	Art Deco weekend.	2	3	Conference.	6	4	Wedding party.	6
Indoor activities											
1	Curling at Naseby.	46	5	Touch rugby	1	9	Maps and local information.	1	13	Catholic Church.	1
2	Curling at Alexandra	2	6	Gun club.	1	10	Game	4			
3	Swimming pool.	7	7	Reading materials.	46	11	Photography workshop.	2			
4	Bowling.	2	8	Music.	1	12	Cafe Culture	2			
Outdoor activities											
1	Golf.	55	13	Water sports	12	24	Winter sports.	54	36	Feeding hens/ cattle.	3
2	Tennis.	14	14	Rock climbing.	1	25	Scenic flight	1	37	Wildlife watching.	4
3	Croquet.	1	15	Tramping.	4	26	Wind surfing.	1	38	Triathlon track.	1
4	Hiking.	6	16	Horse riding.	11	27	4WD tour.	27	39	BMX track.	1
5	Basketball.	2	17	Horse racing.	1	28	Mt Ida adventure tour.	1	40	Scroll plain wetland.	1
6	Netball.	1	18	Riding mountain bike.	31	29	High country experience tour.	2	41	Landscape painting.	6
7	Squash.	1	19	Road biking.	7	30	Ophir guided tour.	1	42	Landscape photography.	26
8	Soccer	1	20	The Brass Monkey motorcycle rally.	1	31	Hunting.	8	43	Gold mining.	17
9	Petanque	1	21	Car racing.	1	32	Clay target shooting	1	44	Picnic.	2
10	Boating	21		Dunstan trail.	1	33	Falls dam.	2	45	Play ground.	3
11	Fishing.	71	22	Jet trail.	2	34	Farm tour/track.	15	46	Community owned camp ground at Clyde (functions as social centre).	1
12	Swimming.	18	23	Walking.	48	35	Sheep mustering activities.	4	47	Recreational activities	2
No = Number of cultural products and activities types.											
F= Frequency(number of accommodation services offering the facilities and activities .											

timber														
Mixed stone and mud brick	18	0.8	1	6	1	6	1	6	-	-	-	-	-	-
Mixed timber, stone and concrete	17	0.8	1	6	2	11	-	-	-	-	-	-	-	-
Mixed stone, mud brick and timber	12	0.5	-	-	-	-	-	-	-	-	-	-	1	12
Mixed timber, aluminium facade and wood joinery	12	0.5	1	12	-	-	-	-	-	-	-	-	-	-
Mixed timber, concrete and brick	44	2	-	-	-	-	-	-	1	44	-	-	-	-
Total bed spaces	2125	100												
<p>Stone includes: schist stone, stone and rock. Brick includes: red brick and brick. One of two hotels with N/A capacity. N= Number of accommodation services. C= Capacity (number of bed space).</p>														

Appendix.9: OCRT- SC (self contained) accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ^{5,11}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
2	NB	7	•	–	–	–	–	–	–	–	–	–	–
7	NB	42	•	–	–	–	–	–	–	–	–	–	–
2	RB	13	–	2	•	–	2	–	–	2	S	–	–
1	RB	5	•	1	–	–	1	–	–	–	–	–	–
1	RB	5	•	1	–	–	1	–	–	–	–	–	–
1	NB	4	•	1	–	–	1	–	–	–	–	–	–
1	RB	8	•	1	–	–	–	3	–	–	–	–	–
1	RB	5	•	–	–	–	1	–	–	1	S	1	S
2	NB	6	•	–	–	–	1	4	–	–	–	–	–
1	RB	6	•	1	–	–	1	–	–	–	–	1	S
1	RB	6	•	1	–	–	–	–	–	–	–	–	–
1	NB	4	•	–	–	–	1	–	–	–	–	–	–
1	RB	6	•	1	–	–	1	–	–	1	S	1	S
1	RB	6	•	1	–	–	–	–	–	–	–	1	S
1	RB	6	•	–	•	–	1	3	•	–	–	1	S
1	NB	2	•	–	–	–	–	–	•	–	–	–	–
1	NB	4	•	–	–	–	–	–	•	–	–	–	–
1	NB	5	•	–	–	–	–	–	•	–	–	–	–
1	NB	8	•	–	–	–	–	–	•	–	–	–	–
1	RB	5	•	1	–	–	1	–	–	–	–	1	S
1	RB	9	–	–	•	–	1	–	–	–	–	–	–
3	NB	8	•	–	–	–	–	3	–	–	–	3	P
1	RB	14	•	1	–	–	1	–	–	–	–	–	–
1	NB	9	–	1	–	•	1	–	•	–	–	–	–
2	RB	6	•	1	–	•	1	–	•	–	–	–	–
10	NB	40	•	–	–	•	–	–	•	–	–	–	–
1	NB	8	•	1	–	–	–	–	–	–	–	–	–
1	NB	6	–	–	•	–	–	–	–	1	S	–	–
1	NB	12	–	–	•	–	2	–	•	6	P	–	–
1	NB	8	–	–	•	–	2	–	•	–	–	–	–
1	RB	4	–	–	•	–	–	–	•	–	–	–	–
2	NB	4	•	–	–	–	–	–	–	–	–	–	–
1	NB	3	•	–	–	–	–	–	–	–	–	–	–
1	NB	4	•	1	–	–	2	–	–	–	–	–	–
1	NB	4	•	1	–	–	2	–	–	–	–	–	–
1	RB	4	•	–	–	–	–	–	–	–	–	–	–
1	RB	5	•	1	–	–	1	–	–	–	–	–	–
1	RB	6	•	–	–	–	1	–	–	–	–	–	–
1	RB	2	•	–	–	–	–	1	–	–	–	–	–
1	RB	4	–	1	•	–	–	–	•	–	–	1	S
1	NB	4	–	–	–	–	–	–	–	–	–	–	–
1	RB	4	•	1	•	–	–	1	–	1	S	1	S
1	NB	6	•	–	–	–	–	1	•	–	–	–	–
1	NB	6	•	–	–	–	1	–	•	–	–	–	–
1	NB	2	•	–	–	–	–	1	•	–	–	–	–
1	NB	8	•	–	–	–	–	1	•	–	–	–	–
1	RB	4	•	–	•	•	–	–	–	–	–	1	S
1	NB	8	•	–	•	–	–	–	–	–	–	1	S
1	NB	4	•	1	–	–	–	–	–	–	–	1	S
1	RB	10	–	1	•	–	1	–	–	–	–	–	–
1	RB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	•	1	–	–	1	–	–	–	–	1	S
1	RB	6	•	–	–	–	–	–	–	1	S	–	–
1	NB	16	•	–	–	–	–	5	–	–	–	5	P
1	NB	7	•	–	–	–	1	–	–	–	–	1	S
1	NB	8	•	–	–	–	1	–	–	–	–	–	–
1	NB	6	•	–	–	–	1	–	–	–	–	–	–
1	NB	2	•	–	–	–	1	–	–	–	–	–	–
1	NB	6	•	–	–	–	–	–	•	–	–	–	–
1	NB	5	–	–	•	–	1	–	•	–	–	–	–

1	RB	6	•	–	–	–	–	3	–	–	–	–	–
1	NB	28	•	–	–	–	–	8	–	–	–	–	–
1	RB	4	•	–	–	–	–	1	–	1	S	2	P
1	NB	3	•	–	–	–	–	–	–	•	–	–	–
1	RB	4	–	1	–	•	–	–	–	–	–	–	–
1	NB	13	•	–	•	–	–	–	–	–	–	1	S
2	NB	5	•	–	–	–	–	2	•	–	–	1	S
1	NB	6	•	–	–	–	–	2	•	–	–	1	S
1	NB	4	•	–	–	–	–	2	•	2	P	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation service.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.10: OCRT-B&B accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ^{5&11}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
1	NB	6	•	2	–	–	1	–	–	–	–	–	–
1	RB	10	•	1	–	–	–	–	–	1	S	–	–
1	NB	7	•	1	–	–	1	–	•	–	–	1	S
1	NB	6	•	–	•	–	1	–	–	1	P	–	–
1	RB	5	–	–	•	–	–	2	–	–	–	1	S
1	RB	10	•	–	–	–	1	–	–	–	–	2	S
1	NB	5	•	1	–	–	1	–	–	–	–	–	–
1	RB	32	•	–	–	–	1	–	–	–	–	1	S
1	NB	6	•	–	–	–	1	–	–	–	–	–	–
1	NB	6	•	–	–	–	1	–	–	–	–	–	–
1	NB	12	•	–	–	–	1	–	•	–	–	–	–
1	NB	4	•	–	–	–	–	–	–	–	–	–	–
1	NB	2	•	–	–	–	–	–	–	–	–	–	–
1	NB	2	•	–	–	–	–	–	–	–	–	–	–
1	RB	5	•	1	–	–	–	–	–	–	–	–	–
1	NB	9	•	–	–	–	1	–	–	1	S	1	S
1	RB	11	–	1	–	–	–	–	–	–	–	–	–
1	NB	8	•	–	–	–	1	–	–	–	–	1	S
1	NB	8	•	–	–	–	1	–	–	–	–	–	–
1	RB	6	•	1	–	–	–	–	–	–	–	–	–
1	NB	6	•	1	–	–	–	–	–	–	–	–	–
3	NB	12	•	–	–	•	2	–	•	–	–	–	–
1	NB	5	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	•	–	–	–	1	–	–	–	–	–	–
1	RB	5	•	–	–	–	1	–	•	–	–	–	–
1	NB	6	•	1	–	–	–	–	–	–	–	–	–
1	NB	4	•	–	–	–	1	–	–	–	–	–	–
1	NB	16	•	1	–	–	1	–	–	–	–	1	S
1	NB	6	•	1	–	–	1	–	–	–	–	–	–
1	RB	4	•	–	–	–	–	–	–	–	–	–	–
1	RB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	5	•	1	–	–	–	2	–	2	P	–	–
1	NB	9	•	–	–	–	1	–	–	–	–	3	P
1	RB	6	•	–	–	–	–	–	•	–	–	1	S
1	RB	8	•	1	–	–	–	–	–	1	P	–	–
1	RB	6	•	–	–	–	1	–	–	–	–	–	–
1	NB	8	–	–	•	–	1	–	–	–	–	–	–
1	NB	10	•	–	–	–	–	–	•	–	–	–	–
1	NB	4	–	–	•	–	1	–	–	–	–	2	P
1	RB	4	•	1	–	–	–	–	–	–	–	1	S

1	RB	3	•	–	–	–	1	–	–	–	–	–	–
1	RB	6	•	1	–	–	1	–	–	–	–	1	S
1	RB	6	•	–	–	–	–	–	•	–	–	1	S
1	NB	6	•	1	–	–	–	–	–	–	–	–	–
1	RB	6	•	1	–	–	1	–	–	–	–	–	–
1	NB	7	•	1	–	–	1	–	•	–	–	–	–
1	NB	24	•	–	–	–	–	–	–	–	–	–	–
1	RB	6	•	1	–	–	1	–	–	–	–	–	–
1	NB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	•	–	–	–	3	–	–	–	–	–	–
1	NB	6	•	–	–	–	2	–	–	–	–	1	S
1	NB	4	–	–	•	–	–	–	–	–	–	1	S
1	NB	10	•	–	–	–	–	–	–	–	–	1	S
1	NB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	8	•	–	–	–	–	–	•	–	–	–	–
1	RB	4	•	1	–	–	–	–	–	–	–	1	S
1	RB	4	•	–	–	–	–	–	–	–	–	–	–
1	RB	6	•	–	–	–	1	–	•	–	–	–	–
1	NB	3	•	–	–	–	–	–	•	–	–	–	–
1	NB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	–	–	•	–	3	–	–	–	–	1	S
1	NB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	96	•	–	–	–	–	47	•	–	–	47	P
1	NB	4	–	–	•	–	–	2	•	–	–	–	–

1. No: Number of accommodation services.
 2. Q: Type of building used as accommodation services.
 3. C: Capacity (number of bed spaces).
 4. El: Electricity.
 5. So: Solar system.
 6. S: Shared facilities.
 7. P: Private facilities.
 8. Int: Internet.
 9. V/B: Veranda/balcony.
 10. Gas including central heating and under floor heating systems.
 11. Solar systems used for hot water and lighting (PVs).

Appendix.11: OCRT- Bp accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ^{5&11}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
3	NB	18	•	–	–	•	–	–	–	–	–	–	–
1	RB	25	–	–	–	–	1	–	–	–	–	–	–
1	NB	6	•	1	–	–	–	–	–	–	–	–	–
1	RB	18	–	–	–	–	–	–	–	–	–	–	–
1	NB	12	•	–	–	–	–	–	–	–	–	–	–
1	RB	6	•	–	–	–	–	–	–	–	–	–	–
1	NB	7	•	–	–	–	–	–	–	–	–	–	–
1	NB	22	•	–	–	–	–	5	–	–	–	–	–
1	NB	18	–	–	•	–	–	3	•	–	–	–	–
1	RB	4	•	–	–	–	–	–	–	–	–	–	–

1. No: Number of accommodation services.
 2. Q: Type of building used as accommodation services.
 3. C: Capacity (number of bed spaces).
 4. El: Electricity.
 5. So: Solar system.
 6. S: Shared facilities.
 7. P: Private facilities.
 8. Int: Internet.
 9. V/B: Veranda/balcony.
 10. Gas including central heating and under floor heating systems.
 11. Solar systems used for hot water and lighting (PVs).

Appendix.12: OCRT - Motel accommodation services, energy sources and facilities.													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
3	NB	13	•	–	–	–	–	–	–	–	–	–	–
1	NB	12	•	–	–	–	–	6	–	–	–	–	–
1	NB	40	–	–	•	–	1	13	•	–	–	–	–
1	NB	2	•	–	•	–	1	–	•	–	–	–	–
1	NB	4	•	–	•	–	1	–	•	–	–	–	–
1	NB	5	•	–	•	–	1	–	•	–	–	–	–
1	NB	6	•	–	–	–	1	–	–	–	–	–	–
1	NB	16	•	–	–	–	1	6	•	–	–	–	–
1	NB	26	•	–	–	–	–	13	•	–	–	–	–
1	NB	30	•	–	–	–	–	6	–	–	–	1	S
1	NB	44	•	–	–	–	–	10	•	–	–	1	S
1	NB	48	–	–	•	–	–	8	•	–	–	–	–
1	NB	66	•	–	–	–	1	–	•	–	–	–	–
1	NB	24	•	–	–	–	1	7	•	–	–	–	–
1	NB	25 ₁	•	–	–	–	1	–	•	–	–	–	–
1	RB	22	•	–	–	–	–	–	–	–	–	1	S
1	NB	36	•	–	–	–	–	11	•	–	–	1	S
1	NB	16	–	–	•	–	–	4	•	–	–	1	S
1	NB	57	•	–	•	–	–	–	•	–	–	2	P
1	NB	14	•	–	–	–	–	2	•	2	P	2	P
1	NB	42	•	–	–	–	–	–	•	–	–	–	–
8	NB	36	•	–	–	–	–	1	•	–	–	1	S
1	NB	28	•	–	–	–	–	15	•	–	–	–	–
1	NB	53	–	–	•	–	–	15	•	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Solar systems used for hot water and lighting (PVs).

Appendix.13: OCRT- Homestead accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas		S ⁶	P ⁷					
1	RB	4	•	•	–	–	1	–	•	–	–	–	–
1	RB	12	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	•	–	–	–	–	–	–	–	–	1	P
1	RB	6	•	–	–	–	–	–	–	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.14: OCRT- Hotel accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
1	RB	12	•	–	–	–	–	–	–	–	–	1	S
1	RB	16	•	1	–	–	1	–	–	–	–	–	–
1	RB	36	•	–	–	–	–	–	–	–	–	–	–
1	RB	18 ₁	•	–	–	–	1	–	–	–	–	–	–
1	RB	8	•	–	–	–	–	–	–	–	–	–	–
1	RB	30	•	–	–	–	1	–	•	–	–	–	–
1	RB	6	•	1	–	–	–	–	–	1	S	–	–
1	RB	40	•	1	–	–	–	–	–	–	–	–	–
1	RB	18	•	–	–	–	1	–	–	–	–	1	S
1	RB	8	–	–	–	–	1	–	–	1	S	–	–
1	RB	16	•	–	–	–	–	–	–	–	–	1	S
1	RB	18	•	–	–	–	–	–	–	–	–	–	–
1	RB	14	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	–	2	–	–	–	–	–	–	–	–	–
1	RB	12	•	–	–	–	–	–	–	–	–	–	–
1	RB	20	•	–	–	–	–	–	–	–	–	–	–
1	RB	22	•	1	–	–	1	–	•	–	–	–	–
1	RB	17	•	–	–	–	1	–	–	–	–	–	–
1	RB	29	–	–	•	–	1	–	•	1	S	6	P

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.15: OCRT- Camping accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas		S ⁶	P ⁷					
1	NB	6 ¹	•	–	–	–	–	–	–	–	–	–	–
1	NB	6 ¹	•	–	–	–	–	–	–	–	–	–	–
1	NB	6 ¹	•	–	–	–	–	–	–	–	–	–	–
1	NB	8	•	–	–	–	–	–	–	–	–	–	–
1	NB	8	–	–	–	–	–	–	–	–	–	–	–
1	NB	12	–	–	–	–	–	–	–	–	–	–	–
48	NB	288	•	–	–	–	–	–	•	–	–	–	–
24	NB	144	–	–	–	–	–	–	–	–	–	–	–
1	NB	6	•	–	–	–	–	–	–	–	–	–	–
10	NB	25	–	–	–	–	–	–	–	–	–	–	–
288	NB	1728	•	–	–	–	–	–	•	–	–	–	–
183	NB	1098	–	–	–	–	–	–	•	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.16: OCRT- All types of accommodation service- energy sources and facilities																		
Type	Q	Heating			So	TV				Int	V/B				Outdoor sitting			
		El	Log	Gas		S	N T	P	NT		S	N V	P	N V	S	N O	P	N O
SC	NB	297	39	52	49	91	18	89	29	143	6	1	16	8	49	7	24	8
	RB	125	107	54	14	105	15	26	11	16	38	7	0	0	46	9	4	2
	Total	422	146	106	63	196	33	115	40	159	44	8	16	8	95	16	28	10
B&B	NB	356	70	32	12	163	28	105	51	159	9	1	11	3	66	8	109	52
	RB	143	66	5	0	80	9	5	2	23	10	1	8	1	73	9	0	0
	Total	499	136	37	12	243	37	110	53	182	19	2	19	4	139	17	109	52
Bp	NB	65	6	18	18	0	0	8	8	18	0	0	0	0	0	0	0	0
	RB	10	0	0	0	25	1	0	0	0	0	0	0	0	0	0	0	0
	Total	75	6	18	18	25	1	8	8	18	0	0	0	0	0	0	0	0
Motel	NB	486	0	225	0	188	9	423	117	582	0	0	14	2	162	5	71	4
	RB	22	0	0	0	0	0	0	0	0	0	0	0	0	22	1	0	0
	Total	508	0	225	0	188	9	423	117	582	0	0	14	2	184	6	71	4
Homestead	NB	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1
	RB	22	4	0	0	4	1	0	0	4	0	0	0	0	0	0	0	0
	Total	28	4	0	0	4	1	0	0	4	0	0	0	0	0	0	6	1
Hotel	NB	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RB	303	84	29	0	158	8	0	0	81	43	3	0	0	44	3	29	6
	Total	303	90	29	0	158	8	0	0	81	43	3	0	0	44	3	29	6
Camping	NB	2048	0	0	0	0	0	0	0	3114	0	0	0	0	0	0	0	0
	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	2048	0	0	0	0	0	0	0	3114	0	0	0	0	0	0	0	0

Appendix.17: OCRT- All accommodation services by type - energy sources and facilities																	
Q	Heating			So	TV				Int	V/B				Outdoor sitting			
	El	Log	Gas		S	NT	P	NT		S	N V	P	N V	S	N O	P	NO
^{NB}	3258	121	327	79	442	55	625	205	4016	15	2	41	13	277	20	210	65
^{RB}	626	261	88	14	372	34	34	13	124	91	11	8	1	185	22	33	8
^{Total}	3884	382	415	93	814	89	659	218	4140	106	13	49	14	462	42	243	73

Appendix.18: OCRT- accommodation services- Area per bed space (2011)						
Location	Accommodation	Type	Q	Area (m ²)	C	Area per Bed (m ²)
SC						
Middlemarch	Gladbrook	SC	RB	371	13	28.5
Middlemarch	Pukenangi Country Retreat	SC	RB	314	8	39
Middlemarch	The Rocks Luxury Accommodation/ Longford Retreat	SC	RB	178	5	37
Ranfurly	Moyola Art Deco Guest House	SC	RB	200	6	33
Naseby	Royal Hotel (SC)	SC	RB	88	4	22
Oturehua	Crowsnest Accommodation (2 cabins)	SC	NB	22	4	5.5
Lauder	Big Shy Cottage	SC	RB	233	4	58
Lauder	Pedal Inn	SC	RB	142	6	24
Omakau	Hawksview B&B	SC	RB	190	6	32
Alexandra	Marj's Place (Homestead)	SC	NB	79	5	16
B&B						
Middlemarch	Annandale	B&B	NB	244	6	41
Middlemarch	Middlemarch B&B	B&B	NB	260	7	37
Middlemarch	Rose cottage	B&B	NB	142	6	24
Middlemarch	Strathmore B&B	B&B	RB	287	5	56
Middlemarch	The Lodge	B&B	RB	282	10	28
Middlemarch	The Rocks Luxury	B&B	NB	408	5	82

	Accommodation/ Braeside Cottage					
Ranfurly	Annerly House	B&B	NB	338	9	37.5
Wedderburn	Wedderburn Tavern	B&B	RB	309	14	22
Naseby	Old Doctor's Residence	B&B	RB	254	5	51
Poolburn	Solandra Lodge Country style B&B	B&B	NB	120	8	15
Omakau	Church Hill B&B	B&B	RB	224	6	37
Alexandra	Hawkdun Rise Vineyard Homestead	B&B	NB	433	6	72
Alexandra	Log House retreat	B&B	NB	135	6	22.5
Motel						
Waipiata	Waipiata Motel	Motel	NB	137	12	11.5
Ranfurly	Ranfurly Motel	Motel	NB	195	16	12.2
Alexandra	Alexandra Almond Court Motel	Motel	NB	411	48	8.6
Alexandra	Central Court Motel Inn	Motel	NB	1530	66	23
Clyde	Antique Lodge Motel	Motel	NB	539	24	22.5
Bp						
Kokonga	2 Wheel Backpacker	Bp	NB	144	6	24
Oturehua	Crowsnest Accommodation (Bunkrooms/lodge)	Bp	NB	60	12	5
Alexandra	Criterion Club Hotel (BP)	Bp	NB	378	22	17
Alexandra	Marj's Place (Bp)	Bp	NB	115	18	6
Hotel						
Middlemarch	Strath Taieri Hotel	Hotel	RB	473	12	39.4
Macraes Flat	Stanley's Hotel	Hotel	RB	466	16	29.1
Ranfurly	Ranfurly Lion Hotel	Hotel	RB	1698	30	56.6
Naseby	Ancient Briton Hotel	Hotel	RB	360	40	9
Naseby	Royal Hotel(hotel)	Hotel	RB	421	18	23.4
Becks	White House Hotel	Hotel	RB	478	18	26.5
Omakau	Omaka Commercial Hotel	Hotel	RB	642	22	29.2
Homestead						
Waipiata	Peter's Farm Lodge- the homestead	Homes tead	NB	253	6	42
Auripo	Taradale Homestead	Homes tead	RB	100	6	16.6

Appendix.19: OCRT accommodation services - Average area of outdoor sitting spaces					
Location	No.	Accommodation	Type	Area (m ²)	Type
Veranda/ Balcony					
Middlemarch	1	Cottesbrook	SC	14	Veranda
Middlemarch	2	Gladbrook	B&B	30	Veranda
Middlemarch	3	Gladbrook	SC	30	Veranda
Hyde	4	Pine Grove	SC	18	Veranda
Hyde	5	Pine Grove	SC	18	Veranda
Kokonga	6	2 Wheel Backpackers	Bp	5	Veranda
Waipiata	7	Peter's farm Lodge	Homestead	12	Part of veranda used as sitting
Lauder	8	Big Sky Cottage	SC	15	Veranda
Lauder	9	Lauder Burn House	B&B	18	Veranda
Lauder	10	Lauder Burn House	B&B	6	Balcony
Cromwell	11	Colonial Manor Motel	Motel	3	Balcony
Cromwell	12	Golden Gate lodge	B&B	3	Balcony
Total	-	-	-	172	-
Average area (m ²) per veranda/ balcony = 14.3					
Outdoor sitting					
Middlemarch	1	Middlemarch B&B	B&B	30	Sheltered outdoor sitting
Kokonga	2	2 Wheel Backpackers	Bp	15	Outdoor sitting
Waipiata	3	Peter's farm Lodge	Homestead	35	Garden sitting
Cromwell	4	Central gold Motel	Motel	9	Outdoor sitting
Cromwell	5	Golden Gate lodge	B&B	9	Outdoor sitting
Total	5	-	-	98	-
Average area (m ²) per outdoor sitting space = 19.5					

Appendix.20: OCRT- Types of outdoor activities and their frequency (2011)

Sports (at playground)	F	Motorised sports and activities	F	Water sports	F	Winter sports	F	Cycling	F	Sports on horseback	F	Recreational activities	F	Art activities	F	Farm activities	F	Walking	F	Climbing.	F
Golf	55	The Brass Monkey motorcycle rally	1	Boating	21	Winter sports	54	Riding mountain bike	31	Horse riding	11	Scenic flight	1	Landscape painting	6	Farm tour/track	15	Tramping	4	Rock climbing	1
Tennis	14	Car racing	1	Fishing	71	-	-	Road biking	7	Horse racing	1	Wind surfing	1	Landscape photography	26	Sheep mustering activities	4	Walking	48	-	-
Croquet	1	4WD track/tour	27	Swimming	18	-	-	Dunstan trail	1	-	-	Recreational activities	2	-	-	Feeding hens/ cattle	3	-	-	-	-
Hiking	6	Jet trail	2	Water sports (undefined)	12	-	-	Triathlon track.	1	-	-	Gold mining	17	-	-	-	-	-	-	-	-
Basketball	2	-	-	-	-	-	-	BMX track	1	-	-	Picnic	2	-	-	-	-	-	-	-	-
Netball	1	-	-	-	-	-	-	Scroll plain wetland	1	-	-	Hunting	8	-	-	-	-	-	-	-	-
Squash	1	-	-	-	-	-	-	-	-	-	-	Clay target shooting	1	-	-	-	-	-	-	-	-
Soccer	1	-	-	-	-	-	-	-	-	-	-	Falls dam	2	-	-	-	-	-	-	-	-
Touch rugby	1	-	-	-	-	-	-	-	-	-	-	Wildlife watching	4	-	-	-	-	-	-	-	-
Petanque	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Play ground (undefined sports)	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	86		31		122		54		42		12		38		32		22		52		1

Appendix.21: Visits offered by OCRT- accommodation services to visitors (2011)

Cities and villages	F	Historic sites and buildings	F	Archaeological industry	F	Scenery	F	Garden/ farm/park	F	Museum/art gallery	F
Middlemarch	15	Tour of Bare Wood Station	1	Matakanui (town to gold mining heritage)	2	Matakanui river	1	Wineries	34	Museum (undefined)	5
Kakanui	1	Historic Wedderburn village	4	Cambrian (town to gold mining heritage).	2	Clutha river	4	Garden/ farm/park	41	Art Deco museum	1
Hawkdun	2	Historical sites and buildings (undefined)	85	Macraes Flat gold mining town	2	Sutton Salt Lake	9	Beer garden	3	Railway station museum	9
Ida valley	1	The old Waipiata Sanatorium	3	Daniel O'Connell bridge	4	Blue Lake	3	World class garden	1	Ballarat Cottage art museum	1
Omakau	5	Historic St Bathans village	22	Iconic steal lattice bridge	1	Dunstan Lake	4	Naseby town garden	1	The Clyde museum	8
Ophir	7	Smooth Cone Hill	2	Clutha bridge	1	Bannockburn Lake	1	Queenstown National park	1	Central stories museum and art gallery	1
Alexandra	11	Drybread	1	Shaky bridge	1	Manuherikia river	6	Oteake conservation park	3	The Herb museum.	7
Clyde	9	-	-	Taieri Gorge Railway	5	Taieri river	4	Cromwell's Anderson park	1	Oturehua museum	1
Naseby	16	-	-	Tour of the nearby Oceania Gold-Open-Cast mine at Macraes	3	Roxburgh Gore scenery	1	Art, Sculpture& Gardens (art studio)	1	Early settlers' museum	1
Waipiata	2	-	-	The old Golden Point mine in Deepdell Creek	1	Queenstown bay	1	Watch farming demonstration	3	Ranfurly's own Art Deco gallery	1
Oturehua village	3	-	-	Historic Hamilton's goldfields cemetery	4	Dunstan Range	2	Private farm	11	Exploring painters and photographers paradise	3
Poolburn Gorge	1	-	-	Historic Hayes Engineering	7	Rough Ridge Ranges	1	-	-	Art room	1
Thompsons Gorge	1	-	-	Gold progress mine (heritage)	1	Rock and Pillar Range	9	-	-	Rural Art Deco tour of Ranfurly	1
Cromwell Gorge	14	-	-	Chinese miner's hut	1	Scenery	72	-	-	-	-
Drybread	1	-	-	The historic Doctor point Gold Digging s Clutha river	1	Aquatic centre	1	-	-	-	-

Manitoto Plains	8	-	-	Gold mining heritage	25	Poolburn dam	3	-	-	-	-
-	-	-	-	-		Clyde dam	10	-	-	-	-
Total	97	-	118	-	61	-	132	-	100	-	40

Appendix.22: Naseby: All types of accommodation service - energy sources and facilities																		
Type	Q	Heating			So	TV				Int	V/B				Outdoor sitting			
		El	Log	Gas		S	N T	P	NT		S	N V	P	N V	S	N O	P	N O
SC	NB	48	17	26	49	29		0	0	69	6	1	1 2	6	0	0	0	0
	RB	6	6	4	0	6		0	0	10	0	0	0	0	0	0	0	0
	Total	54	23	30	49	35		0	0	79	6	1	1 2	6	0	0	0	0
B&B	NB	23	0	0	12	18	3	0	0	12	0	0	0	0	0	0	0	0
	RB	5	0	0	0	5	1	0	0	5	0	0	0	0	0	0	0	0
	Total	28	0	0	12	23	4	0	0	17	0	0	0	0	0	0	0	0
Hotel	NB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RB	58	40	0	0	18	1	0	0	0	0	0	0	0	18	1	0	0
	Total	58	40	0	0	18	1	0	0	0	0	0	0	0	18	1	0	0
Camping	NB	288	0	0	0	0	0	0	0	288	0	0	0	0	0	0	0	0
	RB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	288	0	0	0	0	0	0	0	288	0	0	0	0	0	0	0	0

Appendix.23: Naseby: Self contained accommodation services, energy sources and facilities.													
No. ₁	Q ²	C ³	Heating			So ^{5,11}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
1	NB	9	-	1	-	1	1	-	1	-	-	-	-
2	RB	6	•	1	-	-	1	-	1	-	-	-	-
10	NB	40	•	-	-	•	-	-	•	-	-	-	-
1	NB	8	•	1	-	-	-	-	-	-	-	-	-
1	NB	6	-	-	•	-	-	-	-	1	S	-	-
1	NB	12	-	-	•	-	2	-	•	6	P	-	-
1	NB	8	-	-	•	-	2	-	•	-	-	-	-
1	RB	4	-	-	•	-	-	-	•	-	-	-	-

No: Number of accommodation services.
Q: Type of building used as accommodation service.
C: Capacity (number of bed spaces).
El: Electricity.
So: Solar system.
S: Shared facilities.
P: Private facilities.
Int: Internet.
V/B: Veranda/balcony.
Gas including central heating and under floor heating systems.
Solar systems used for hot water and lighting (PVs).

Appendix.24: Naseby: B&B accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ^{5&11}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
3	NB	12	•	–	–	•	2	–	•	–	–	–	–
1	NB	5	•	–	–	–	–	–	–	–	–	–	–
1	NB	6	•	–	–	–	1	–	–	–	–	–	–
1	RB	5	•	–	–	–	1	–	•	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.25: Naseby: Hotel accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
1	RB	40	•	1	–	–	–	–	–	–	–	–	–
1	RB	18	•	–	–	–	1	–	–	–	–	1	S

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.

Appendix.26: Naseby: Camping accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas		S ⁶	P ⁷					
48	NB	288	•	–	–	–	–	–	•	–	–	–	–
24	NB	144	–	–	–	–	–	–	–	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.27: Naseby: All accommodation services by type - energy sources and facilities																		
Q	Heating						So	%	TV				Int	%	Outdoor sitting ¹			
	El	%	Log	%	Gas	%			S	%	P	%			S	%	P	%
NB	359	58.7	17	2.8	26	4.3	61	10	47	7.7	0	0	369	60.4	6	0.9	12	2
RB	69	11.3	46	7.5	4	0.6	0	0	29	4.7	0	0	15	2.4	18	3	0	0
Total	428	70	63	10.3	30	4.9	61	10	76	12.4	0	0	384	62.8	24	3.9	12	2

In this table veranda /balcony and outdoor sitting are combined together.
Total Naseby OCRT bed spaces = 611

Appendix.28: Naseby: Cultural Products and Activities		
Local produce		
No.		F
1	Continental Breakfast	7
2	Home baking and local food	3
3	Wine	2
General produce		
1	Food and beverages	10
Services		
No services		
Visits		
1	Naseby	13
2	Historical sites and buildings (undefined)	10
3	Scenery	6
4	Museum (undefined)	5
5	Gold mining heritage	3
6	Naseby town garden	1
7	Art, Sculpture& Gardens (art studio)	1
Events		
1	Local annual events/festivals	4
Indoor activities		
1	Curling at Naseby	16
2	Reading materials	1
3	Music	1
4	Cafe Culture	1
Outdoor activities		
1	Walking	15
2	Riding mountain bike	14
3	Winter sports	14
4	4WD track/tour	13
5	Fishing	11
6	Horse riding	7
7	Gold mining	7
8	Swimming	7
9	Golf	5
10	Hiking	4
11	Hunting	4
No = Number of cultural products and activity types.		
F= Frequency (number of accommodation services offering the facilities and activities)		

Appendix.29: Cromwell - Self contained accommodation services, energy sources and facilities.													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
2	NB	5	•	–	–	–	–	2	•	–	–	1	S
2	NB	6	•	–	–	–	–	2	•	–	–	1	S
1	NB	4	•	–	–	–	–	2	•	2	P	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation service.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system used for water heating.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.

Appendix.30: Cromwell - B&B accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ⁵	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
1	NB	96	•	–	–	–	–	47	•	–	–	47	P
1	NB	4	–	–	•	–	–	2	•	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system used for water heating.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.

Appendix.31: Cromwell - Motel accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ^{5,1}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
1	NB	36	•	–	–	–	–	11	•	–	–	1	S
1	NB	16	–	–	•	–	–	4	•	–	–	1	S
1	NB	57	•	–	•	–	–	–	•	–	–	2	P
1	NB	14	•	–	–	–	–	2	•	2	P	2	P
1	NB	42	•	–	–	–	–	–	•	–	–	–	–
8	NB	36	•	–	–	–	–	1	•	–	–	1	S
1	NB	28	•	–	–	–	–	15	•	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.32: Cromwell - Camping accommodation services, energy sources and facilities													
No. ¹	Q ²	C ³	Heating			So ^{5&1}	TV		Int ⁸	V/B ⁹	S/P	Outdoor sitting	S/P
			El ⁴	Log	Gas ¹⁰		S ⁶	P ⁷					
288	NB-powered sites	1728	•	–	–	–	–	–	•	–	–	–	–
183	NB-non-powered sites	1098	–	–	–	–	–	–	•	–	–	–	–

1. No: Number of accommodation services.
2. Q: Type of building used as accommodation services.
3. C: Capacity (number of bed spaces).
4. El: Electricity.
5. So: Solar system.
6. S: Shared facilities.
7. P: Private facilities.
8. Int: Internet.
9. V/B: Veranda/balcony.
10. Gas including central heating and under floor heating systems.
11. Solar systems used for hot water and lighting (PVs).

Appendix.33: Cromwell - All types of accommodation service, energy sources and facilities																	
Type	Heating			So	TV				Int	V/B				Outdoor sitting			
	El	Log	Gas		S	N T	P	N T		S	N V	P	NV	S	No	P	No
SC	15	0	0	0	0	0	15	6	15	0	0	4	2	11	2	0	0
B&B	96	0	4	0	0	0	100	49	100	0	0	0	0	0	0	96	47
Motel	213	0	73	0	0	0	130	33	229	0	0	14	2	36	1	14	2
Camping *	1,728	0	0	0	0	0	0	0	2,826	0	0	0	0	0	0	0	0

- Camping includes powered and non-powered sites.
- The qualities of all campsites are NB

Appendix.34: Cromwell - Cultural Products and Activities		
No.	Local produce	F
1	Wine.	15
2	Continental Breakfast.	3
3	Home baking and local food.	1
General produce		
1	Food and beverages	17
Services		
1	Motorcycle hire	12
2	Tour activities booking centre	1
3	Bike hire	1
4	Sport equipments (undefined- hire/sale)	1
Visits		
1	Wineries	20
2	Cromwell town	16
3	Garden (private/ surrounding)	4
4	Gold mining heritage	3
5	Scenery	3
6	Historic sites and buildings (undefined)	2
7	Clyde	1
8	Lake Dunstan	1
9	Museum (undefined)	1
10	Cromwell Anderson park	1
Events		
1	Local annual events/festivals.	3
2	Conference	1
Indoor activities		
1	Reading materials.	2
Outdoor activities		
1	Golf	17
2	Swimming	16
3	Winter sports	15
4	Fishing	14
5	Boating	13
6	Biking	13
7	Scenic flights	12
8	Walking	6
9	Water sports	5
10	Jet trail	3
11	Mountain biking	2
12	4WD track/tour	2
13	Tennis	1
14	Netball	1
15	Squash	1
16	Horse racing	1
17	Car racing	1
18	Wind surfing	1
19	Gold mining	1
20	Picnic	1
No = Number of cultural products and activities types.		

Appendix.35: Cromwell – outdoor activities		
Activity	F	%
Golf	17	13.5
Swimming	16	12.7
Winter sports	15	11.9
Fishing	14	11.1
Boating	13	10.3
Biking	13	10.3
Scenic flights	12	9.5
Walking	6	4.8
Water sports	5	3.9
Jet trail	3	2.4
Mountain biking	2	1.6
4WD track/tour	2	1.6
Tennis	1	0.8
Netball	1	0.8
Squash	1	0.8
Horse racing	1	0.8
Car racing	1	0.8
Wind surfing	1	0.8
Gold mining	1	0.8
Picnic	1	0.8
Total	126	100

Appendix.36: Cromwell – Subjects offered to visit and their frequency		
Wineries	20	38.5
Cromwell town	16	30.8
Garden (private/ surrounding)	4	7.7
Gold mining heritage	3	5.8
Scenery	3	5.8
Historic sites and buildings (undefined)	2	3.8
Clyde	1	1.9
Lake Dunstan	1	1.9
Museum (undefined)	1	1.9
Cromwell Anderson park	1	1.9
Total	52	100